JOURNAL
of the
American Veterinary Medical Association
Formerly AMERICAN VETERINARY REVIEW
(Original Official Organ U. S. Vet. Med. Assn.)
H. Preston Hoskins, Secretary-Editor, 1230 W. Washington Blvd., Chicago, Ill.

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Vol. LXXXI, N. S. Vol. 34 DECEMBER, 1932 No. 6

THE CASE AGAINST THE AGRICULTURAL EXTENSION SERVICE

Evidence continues to accumulate showing that county farm advisers in some states have been violating the provisions of the Smith-Lever Act, approved May 8, 1914, authorizing the present agricultural extension service. Section 2 of the Act provides as follows:

> That coöperative agricultural extension work shall consist of the giving of instruction and practical demonstrations in agriculture and home economics to persons not attending or resident in said colleges in the several communities, and imparting to such persons information on said subjects through field demonstrations, publications, and otherwise; and this work shall be carried on in such manner as may be mutually agreed upon by the Secretary of Agriculture and the state agricultural college or colleges receiving the benefits of this act.

As time went on and the coöperative agricultural extension work developed, situations arose which made it necessary to have the Smith-Lever Act, or sections of it, officially interpreted and more clearly defined. Such an occasion arose about ten years ago. Under date of August 25, 1922, the then Secretary of Agriculture, in discussing the subject, made the following statement:

> It is thus made clear that the work of the coöperative extension employees, whether county agents, home demonstration agents,

> boys' and girls' club agents, or other coöperative extension workers, is *educational*. These extension workers are *public teachers* paid with money raised from all of the people by taxation and are charged with giving instruction and practical demonstrations in agriculture and home economics. Their work covers the entire rural field, which includes economic production, economic marketing, and the development of better home, community, and social conditions.
>
> As they are public teachers it is *not* a part of the official duties of extension agents to perform for *individual farmers* or for organizations the *actual operations* of production, marketing, or the various activities necessary to the proper conduct of business or social organizations. They may *not* properly act as *organizers* for farmers' associations; *conduct* membership campaigns; *solicit* membership; *edit* organization publications; *manage* coöperative business enterprises; *engage in commercial activities; act as financial or business agents*, or take part in any of the work of farmers' organizations, or of an individual farmer, which is outside of their duties as defined by the law and by the approved projects governing their work. They are expected, however, to make available to organizations such information as will be helpful to them and contribute to the success of their work.

The italics are ours. Note that the Secretary of Agriculture specifically mentioned numerous activities in which extension workers might *not* legally engage. It might properly be assumed that complaints that extension workers were doing these things had been made to the Department of Agriculture and that the Secretary of Agriculture had considered it necessary to point out what farm advisers and other extension workers could do, within the meaning of the Act.

The testimony which has been given at hearings held by the Shannon Congressional Committee during recent months has fully corroborated the assumption expressed in the preceding paragraph. As a matter of fact, some of the evidence was rather startling to those who previously were unfamiliar with conditions in some sections where the situation was clearly "out of hand." Deliberate disregard of orders from Washington apparently was the established policy in some quarters. Elsewhere the law has been violated only occasionally, under some pretext or another. In other instances attempts have been made to violate the law clandestinely.

It is greatly to be regretted that a comparatively new governmental activity, sponsored by legislators with only the loftiest of ideals, should have been so administered through the years that it steadily but surely was getting into bad repute among those whom it was designed to serve. First of all, there has not been the proper kind of supervision of the expenditure of federal funds. The original purpose of the Smith-Lever Act appears to have been forgotten in some states. Like a rotten apple in a

barrel, the condition spread. When one extension worker got away with something, another would try the same thing. All too frequently what was at first an apparently unimportant encroachment upon private business was allowed to go unnoticed by the proper supervisory officials. Or, what was worse, in some cases these intrusions were tacitly approved by those in charge, possibly as a temporary bid for public favor and without a weather eye to the future of the work. Teachers in Smith-Hughes high schools, in some instances, have been offenders to an extent equal to workers under the Smith-Lever Act.

Veterinarians, as a group, were among the first to feel the effects of these uncontrolled activities of extension workers. Veterinarians protested, but to little or no avail in many cases. They were told that their hurts were imaginary and everything would turn out all right. There even were positive denials of some of the charges made by veterinarians. It was not until other professional and business groups began to feel the effects of unethical and unfair competition that any official notice was taken of a bad situation. The appointment of the Shannon Congressional Committee to investigate government competition with private business was the next move. The Committee is already in possession of a mass of evidence, about 6,500 typewritten pages, according to a recent report, and the illegal activities of farm advisers have helped to form the basis for a lot of it.

It should be stated here, in fairness to those states where extension work has been intelligently directed, that very little criticism has been voiced against the work in these states. We repeat the statement that has been made frequently before, that the state director of extension holds the key to the situation, as far as his own state is concerned. For that reason we have advocated the general policy of each state attempting to settle its own problem, where there was one. This policy has worked out satisfactorily in a few states. In others it has accomplished nothing worth while. In several states the situation is extremely bad, in spite of the efforts that veterinarians have made to bring about improvement.

Veterinarians have no quarrel with extension workers who go about their work in the way the law provides. In a number of states veterinarians and extension workers coöperate to mutual advantage. Each respects the other and harmony prevails. The level-headed farm adviser recognizes the fact that he is not a veterinarian and makes no attempt to appear as one. He leaves veterinary problems, including strictly veterinary extension work,

to the veterinarian. The farm adviser who has the real interests of the people of his county at heart finds that he has just about all he can attend to in other lines of work. He finds it unnecessary to meddle with something he knows very little about, and he does not go around masquerading as a veterinarian.

In counties and smaller communities that are adequately supplied with competent veterinary service there appears to be no valid reason for farm advisers and Smith-Hughes teachers attempting to fill the rôle of veterinarian, except in the case of an extreme emergency. There will be few occasions, indeed, when any stretch of the imagination will justify extension workers performing autopsies, making diagnoses, or treating whole herds or flocks for this, that and the other disease.

It is our sincere hope that the federal officials in charge of agricultural extension work, as well as those in charge in the states, will appraise the present situation fairly and take steps that will result in the complete abolition of the abuses which have crept insidiously into the agricultural extension service in certain quarters. The unfavorable advertising which these cancerous spots have given to the whole service, not to mention the ever-present danger of the cancer metastasizing, should cause considerable concern to the officials in charge. There is yet time for them to act before they are destroyed by the growth that they have nourished, willingly or otherwise.

SPAIN APPRECIATES VETERINARY SERVICE

In this issue of the JOURNAL appears a review of a book that minutely describes the new veterinary service of the Republic of Spain. Spanish veterinarians are to be congratulated on the comprehensive scheme that has been worked out for controlling animal diseases in the republic. "Veterinary activities in charge of veterinarians" seems to have been the watchword of those who formulated the new regulations. No detail has been overlooked, not even the control of diseases of the silkworm. Veterinary education is integrated with veterinary sanitary control work, so as to insure properly trained "animal engineers" for handling the veterinary problems with which Spain will be confronted from time to time. To those veterinarians who are located in states or countries where the profession does not have full control of veterinary affairs, the forward step taken by Spain holds out more than a ray of hope. It really looks as though a proper appreciation of the value of a competent, unhampered veterinary

service is beginning to manifest itself in high places. Let us all unite in expressing the hope that the new order of things veterinary in Spain will be fully consummated.

EXECUTIVE BOARD ELECTION

Voting has been heavy in the Executive Board election now in progress in District 8. The polls for the nomination of candidates closed on November 7 and the ballots were counted by the Board of Tellers the following day. As soon as the results were certified, election ballots were mailed to the more than 400 members in good standing in the District (Kansas, Missouri, Oklahoma, Arkansas, Texas and Louisiana). The following five members stood highest in the tabulation of votes cast in the primary election, and therefore constituted the ticket:

BURT, J. H. — Manhattan, Kan.

Professor of Veterinary Anatomy and Physiology, Kansas State College. Graduate of Ontario Veterinary College, 1895, and Ohio State University, 1905. Joined A. V. M. A., 1912. Resident Secretary for Kansas, 1915-16 and 1919-20.

BUX, JOE H. — Little Rock, Ark.

State Veterinarian of Arkansas. Graduate of Kansas City Veterinary College, 1908. Joined A. V. M. A., 1917. Resident secretary for Arkansas, 1919-22 and 1928-; member of Committee on Prevention of Transmissible Diseases of Animals, 1926-27.

FLYNN, J. C. — Kansas City, Mo.

Practitioner. Graduate of Kansas City Veterinary College, 1910. Joined A. V. M. A., 1919. Secretary (1924-25) and chairman (1925-26) of Section on Small Animals; member of Committee on Distemper, 1926-29; fourth vice-president, 1926-27; member of Executive Board, 1932.

FRICK, E. J. — Manhattan, Kan.

Professor of Veterinary Medicine, Kansas State College. Graduate of New York State Veterinary College at Cornell University, 1918. Joined A. V. M. A., 1919. Resident secretary for Kansas, 1924-27 and 1930-31.

WALTER, C. R. — Tulsa, Okla.

Practitioner. Graduate of Kansas City Veterinary College, 1908. Joined A. V. M. A., 1922. Resident secretary for Oklahoma, 1926-.

The polls will remain open for the period of two months prescribed by the by-laws, namely, until January 7, 1933.

FIFTY YEARS OF MEMBERSHIP

Dr. Lester H. Howard, of Brookline, Mass., was one of the quartet of members honored at the 1932 A. V. M. A. convention in Atlanta, for having rounded out fifty or more years of continuous membership in the national organization. Dr. Howard joined the A. V. M. A. in 1882. Therefore, this year really

marked the half-century for him. Another distinction belongs to Dr. Howard by reason of the fact that he is the senior past vice-president of the A. V. M. A., having served in this capacity for the year 1884-85. He also was a vice-president for the term 1916-17. Dr. J. C. Meyer, of Cincinnati, another member of the honor roll and the oldest member of the Association, served in the same capacity for the year 1888-89. Dr. Benjamin McInnes, of Charleston, S. Car., who joined the A. V. M. A. in 1876, served as vice-president for the term 1926-27. Dr. C. W. Crowley, of Saint Louis, Mo., the fourth member of the famous quartet, joined the same year. Dr. Crowley was the only one of the four who was able to attend the recent meeting in Atlanta and personally receive the medal awarded each of the four by the Southern States Veterinary Medical Association.

DR. L. H. HOWARD

GROUP INSURANCE

Numerous letters have been received during the past two months, asking for information on group insurance for members of the American Veterinary Medical Association. Undoubtedly these inquiries have been prompted by the recommendation made by Dr. R. R. Dykstra in his presidential address at the recent convention in Atlanta. The possibilities of group insurance for our members are being investigated, although the prospects of anything materializing are not particularly bright at this time. The greatest obstacle appears to be the fact that the members of the A. V. M. A. do not have a common employer. Watch the JOURNAL for announcement of any developments.

DOCTOR CREWE DIES

Just as the forms for this issue of the JOURNAL are being closed, we learn of the death of Dr. W. F. Crewe, of Bismarck, North Dakota, after a brief illness due to pneumonia. Full obituary will appear in the next issue of the JOURNAL.

Allied Laboratories to Kansas City

The executive offices of Allied Laboratories, Inc., will be transferred from Chicago to Kansas City, Mo., December 3, 1932, according to an announcement recently made by Dr. Edward A. Cahill, President. The Kansas City offices will be located at 3105-07-09 Gillham Plaza.

APPLICATIONS FOR MEMBERSHIP

(See July, 1932, JOURNAL)

FIRST LISTING

CASE, JOHN D., JR. West Main St., Clinton, N. J.
D. V. M., University of Georgia, 1932
Vouchers: E. R. Cushing and Harry C. Miller.

FULLER, JACK G. Cornell University, Ithaca, N. Y.
D. V. M., Chicago Veterinary College, 1917
Vouchers: J. N. Forst and D. H. Udall.

MCMAHON, FRANK D. 337 N. Sixth Ave., Phoenix, Ariz.
D. V. M., Chicago Veterinary College, 1920
Vouchers: J. C. McGrath and T. B. Jones.

SKIDMORE, LOUIS V. Dept. of Ani. Path. & Hygiene, Coll. of Agr., University of Nebraska, Lincoln, Nebr.
D. V. M., Kansas State College, 1920
Vouchers: J. N. McIlnay and L. Van Es.

TABBUT, HERBERT M. Dept. of Veterinary Anatomy, Iowa State College, Ames, Iowa.
D. V. M., Iowa State College, 1932
Vouchers: T. S. Leith and Geo. R. Fowler.

Applications Pending

SECOND LISTING

(See November, 1932, JOURNAL)

Kester, Wayne O., 50 E. Buchtel Ave., Akron, Ohio.
Skoog, Harry E., c/o Y. M. C. A., Pittston, Pa.
Steinman, Frank C., 304 W. T. Waggoner Bldg., Fort Worth, Texas.
Terry, Edward E., 3606 Welsh Road, Holmesburg, Philadelphia, Pa.

The amount which should accompany an application filed this month is $5.42, which covers membership fee and dues to January 1, 1933, including subscription to the JOURNAL.

COMING VETERINARY MEETINGS

United States Live Stock Sanitary Association. Hotel LaSalle, Chicago, Ill. November 30, December 1-2, 1932. Dr. O. E. Dyson, Secretary, 45 Live Stock Exchange, Wichita, Kan.

National Association of B. A. I. Veterinarians. Hotel LaSalle, Chicago, Ill. November 30, December 1-2, 1932. Dr. F. A. Imler, Secretary, 19 Federal Bldg., Kansas City, Kan.

New York City, Veterinary Medical Association of. Academy of Medicine, 5th Ave. & 103rd St., New York, N. Y. December 7, 1932. Dr. John E. Crawford, Secretary, 708 Beach 19th St., Far Rockaway, Long Island, N. Y.

San Diego-Imperial Veterinary Medical Association. San Diego, Calif. December 7, 1932. Dr. A. P. Immenschuh, Secretary, Santee, Calif.

Maryland State Veterinary Medical Association. Medical Hall, 1211 Cathedral St., Baltimore, Md. December 8, 1932. Dr. E. M. Pickens, Secretary, College Park, Md.

Tulsa County Veterinary Association. Tulsa, Okla. December 8, 1932. Dr. J. M. Higgins, Secretary, 3305 E. 11th St., Tulsa, Okla.

Southeast Kansas Veterinary Medical Society. Oswego, Kan. December 9, 1932. Dr. L. F. Barthelme, Secretary, Parsons, Kan.

Interstate Veterinary Medical Association. Elks Bldg., Omaha, Neb. December 12, 1932. Dr. G. L. Taylor, Secretary, Plattsmouth, Neb.

Chicago Veterinary Medical Association. Atlantic Hotel, Chicago, Ill. December 13, 1932. Dr. E. E. Sweebe, Secretary, 14th St. & Sheridan Road, North Chicago, Ill.

Nebraska State Veterinary Medical Association. Yancey Hotel, Grand Island, Neb. December 13-14, 1932. Dr. E. C. Jones, Secretary, c/o Platte Valley Serum Co., Grand Island, Neb.

Southeastern Michigan Veterinary Medical Association. Detroit, Mich. December 14, 1932. Dr. A. S. Schlingman, Secretary, Parke, Davis & Co., Detroit, Mich.

Western New York Veterinary Medical Association. S. P. C. A. Headquarters, Buffalo, N. Y. December 15, 1932. Dr. F. F. Fehr, Secretary, 243 S. Elmwood Ave., Buffalo, N. Y.

South Dakota Veterinary Medical Association. Hotel Cataract, Sioux Falls, S. Dak. December 15-16, 1932. Dr. Geo. E. Melody, Secretary, Hoven, S. Dak.

Kansas City Veterinary Association. Baltimore Hotel, Kansas City, Mo. December 20, 1932. Dr. J. D. Ray, Secretary, 1103 E. 47th St., Kansas City, Mo.

Southern California Veterinary Medical Association. Chamber of Commerce Bldg., Los Angeles, Calif. December 21, 1932. Dr. E. E. Jones, Secretary, 1451 Mirasol St., Los Angeles, Calif.

American Association for the Advancement of Science. Atlantic City, N. J. December 27-31, 1932. Dr. Chas. F. Roos, Secretary, Smithsonian Institution Bldg., Washington, D. C.

Keystone Veterinary Medical Association. Philadelphia, Pa. December 28, 1932. Dr. C. S. Rockwell, Secretary, 5225 Spruce St., Philadelphia, Pa.

Pennsylvania, Conference for Veterinarians at University of. School of Veterinary Medicine, University of Pennsylvania, Philadelphia, Pa. January 4-5, 1933. Dr. G. A. Dick, Dean, 39th St. & Woodland Ave., Philadelphia, Pa.

California State Veterinary Medical Association and University of California Veterinary Conference. University Farm, Davis, Calif. January 4-7, 1933. Dr. Geo. M. Simmons, Secretary, 1386 Golden Gate Ave., San Francisco, Calif.

Texas, State Veterinary Medical Association of. Plaza Hotel, San Antonio, Tex. January 5-6, 1933. Dr. D. Pearce, Secretary, Box 335, Leonard, Tex.

Oklahoma Veterinary Medical Association. Skirvin Hotel, Oklahoma City, Okla. January 9-10, 1933. Dr. C. H. Fauks, Secretary, 1919 W. Ash St., Oklahoma City, Okla.

Intermountain Livestock Sanitary Association. Ogden, Utah. January 9-11, 1933. Dr. D. E. Madsen, Secretary, Utah Experiment Station, Logan, Utah.

Wisconsin Veterinary Medical Association. Madison, Wis. January 9-11, 1933. Dr. B. A. Beach, Secretary, University of Wisconsin, Madison, Wis.

Northwestern Missouri Veterinary Medical Association. Tarkio, Mo. January 10, 1933. Dr. R. L. Cundall, Secretary, Fairfax, Mo.

Rhode Island Veterinary Medical Association. State House, Providence, R. I. January 10, 1933. Dr. J. S. Barber, Secretary, 14 Washington St., Central Falls, R. I.

Iowa Veterinary Medical Association. Hotel Savery, Des Moines, Iowa. January 10-12, 1933. Dr. C. J. Scott, Secretary, Knoxville, Iowa.

Maine Veterinary Medical Association. State House, Augusta, Me. January 11, 1933. Dr. L. E. Maddocks, Secretary, R. F. D. 2, Augusta, Me.

Ohio State Veterinary Medical Association. Neil House, Columbus, Ohio. January 11-12, 1933. Dr. R. E. Rebrassier, Secretary, Ohio State University, Columbus, Ohio.

Cornell University, Annual Conference for Veterinarians at. New York State Veterinary College, Ithaca, N. Y. January 12-13, 1933. Dr. W. A. Hagan, Dean, Cornell University, Ithaca, N. Y.

Minnesota State Veterinary Medical Society. West Hotel, Minneapolis, Minn. January 12-13, 1933. Dr. C. P. Fitch, Secretary, University Farm, Saint Paul, Minn.

New Jersey Veterinary Medical Association. Trenton, N. J. January 16-17, 1933. Dr. John G. Hardenbergh, Secretary, c/o Walker-Gordon Lab. Co., Plainsboro, N. J.

Indiana Veterinary Medical Association. Severin Hotel, Indianapolis, Ind. January 17-18, 1933. Dr. W. B. Craig, Secretary, 1420 N. Alabama St., Indianapolis, Ind.

Kansas Veterinary Medical Association. Lassen Hotel, Wichita, Kan. January 18-19, 1933. Dr. Chas. W. Bower, Secretary, 1128 Kansas Ave., Topeka, Kan.

Michigan State College Short Course for Veterinarians. Michigan State College, East Lansing, Mich. January 23-27, 1933. Dr. Ward Giltner, Dean, Michigan State College, East Lansing, Mich.

Missouri Veterinary Medical Association and Special Course for Graduate Veterinarians. University of Missouri, Columbia, Mo. January 23-28, 1933. Dr. J. D. Ray, Secretary, 1103 E. 47th St., Kansas City, Mo.

Virginia Polytechnic Institute, Conference for Graduate Veterinarians at. Blacksburg, Va. January 23-25, 1933. Dr. I. D. Wilson, Virginia Polytechnic Institute, Blacksburg, Va.

Nevada State Veterinary Association. Reno, Nev. January 31, 1933. Dr. Warren B. Earl, Secretary, Box 1027, Reno, Nev.

American Veterinary Medical Association. Palmer House, Chicago, Ill. August 14-18, 1933. Dr. H. Preston Hoskins, Secretary, 1230 W. Washington Blvd., Chicago, Ill.

THE PATHOGENICITY OF THE SAPROPHYTIC ACID-FAST BACILLI*

By WILLIAM A. HAGAN *and* PHILIP LEVINE

Department of Pathology and Bacteriology, New York State Veterinary College, Cornell University, Ithaca, N. Y.

This study had its origin in observations made by Mrs. H. M. Thomson, formerly on our staff, in connection with a study of the allergic relationships between bacilli of the saprophytic† type.[1] It was necessary to sensitize a group of guinea pigs so that they would be skin-sensitive to filtrates. Previous attempts in this direction had taught us that it is not always easy to obtain sufficient sensitivity that clear-cut reactions can be obtained. In this study, therefore, Mrs. Thomson decided to try a method of immunization differing from our previous procedures in that the living bacilli were suspended in oil rather than in an aqueous medium.

In 1926, Vallée and Rinjard[2] reported a vaccination procedure against Johne's disease in which they injected, subcutaneously, the living culture of the causative organism suspended in mineral oil. It was claimed that, when injected in this way, a sclerotic tumor was produced which persisted for a long period without sloughing.

Several years ago, one of us had made use of this method with two calves, our object being to produce complement-fixing antibodies. For nearly two years after the injections, antibodies were demonstrable. At the injection sites, on the side of the neck, dense nodular lesions developed. These slowly increased in size until they were of the size of hen's eggs after a year and a half. Finally one lesion ulcerated and discharged a considerable amount of an oily, whitish pus, in which many morphologically and tinctorially intact bacilli could be demonstrated. Two years after the time of injection, the animals were destroyed. The lesions were very sclerotic. The bacilli stained brilliantly with the Ziehl-Neelson stain and were of normal morphology. No attempt was made to obtain the organism in culture.

This experience furnished us reason to believe that a single

*Presented at the sixty-ninth annual meeting of the American Veterinary Medical Association, Atlanta, Ga., August 23-26, 1932.

†The word is used here to designate all of those acid-fast bacilli which grow rapidly at room or higher temperatures, on most of the simple laboratory media. We include in it, besides the many species found in soil, on plants, on the skin and mucous membranes of animals, in butter and in the alimentary canal of herbivorous animals, certain of the so-called leprosy bacilli and many, if not all, of those organisms associated with tuberculosis of cold-blooded animals.

dose of an oily suspension of the saprophytic bacilli might give a higher degree of sensitization in guinea pigs than repeated doses of aqueous suspensions. Mrs. Thomson therefore prepared such suspensions and made the injections subcutaneously in the region of the shoulder. Within a few days many of the animals began to emaciate and, within three weeks, a considerable number had died. Autopsies revealed abscessation at the injection sites and, to our surprise, miliary lesions in the lungs. In some cases there was a caseating pneumonia. Great numbers of acid-fast bacilli could be seen in smears made from these lungs, and the injected organism could easily be isolated in culture from the lungs as well as from the inoculation sites. No lesions were seen in other organs. Eventually, when all of the remaining animals were sacrificed, it was learned that most of them had had pulmonary involvement. Inasmuch as we had previously inoculated guinea pigs, at one time or another, with several of the cultures used in this study, without observing pulmonary involvement, we were greatly surprised and were led to think that the presence of the oil had so influenced the pathological process that the bacilli had been caused to enter the circulation.

HISTORICAL

A brief review of the literature soon showed that the phenomenon had been observed previously. Lydia Rabinowitsch,[3] in 1897, while studying the subject of tubercle bacilli in market butter, encountered an acid-fast organism now commonly called the "butter bacillus." This organism was isolated from the lesions produced in guinea pigs as a result of their inoculation with the melted butter samples. The lesions resembled closely those caused by tubercle bacilli. Miss Rabinowitsch, however, showed clearly that the organism concerned was not a tubercle organism and, furthermore, that the lesions were not typical of those caused by tubercle bacilli. The lesions were most marked in the peritoneal cavity, where the butter had been deposited, but rather severe involvement of the lungs also occurred in some cases. Some of the animals died as a result of the inoculations, and all became greatly emaciated.

Miss Rabinowitsch inoculated a few guinea pigs, white mice and rabbits with pure cultures of her bacillus. Rabbits and mice appeared to be refractory, but guinea pigs developed the same kind of lesions caused by the infected butter, but the disease due to the pure culture was less severe, on the whole, than that caused by the butter. In a later study, Rabinowitsch[4]

inoculated guinea pigs with necrotic tissue (and with pure cultures of an acid-fast organism isolated from this tissue) from a case of pulmonary gangrene in a man. The animals showed no lesions 6 to 8 weeks later. She reports, however, that when other animals were inoculated with the bacillus suspended in butter, lesions were produced resembling in every way those due to her butter bacillus.

Experimental

In order to study the phenomenon just described, two sets of experiments were set up. In the first experiment the object was to see whether a large series of acid-fast organisms would be rendered invasive through the influence of a fatty suspending medium, and to study the pathological pictures produced. In the later experiment an animal rather than a mineral oil was used to suspend the bacilli, and a direct comparison of the effect of the oil was sought by inoculating a parallel series of animals with the same dose of the organisms suspended in physiological salt solution.

Experiment I

Having a fairly large collection of saprophytic acid-fast organisms at hand, we went over our cultures with the object of making selections from the group so as to represent as fairly as possible the various types. Fourteen cultures were chosen. In addition, a strain of the bacillus of Johne's disease, and one each of the avian and bovine types of tubercle bacilli were included. The pathogenic bacilli were prepared for inoculation in the same way as the saprophytic forms except that the aqueous suspensions were boiled for thirty minutes before centrifuging preparatory to making the oily suspensions.

Identity of Cultures

Because of the danger of confusing the identity of cultures similar in name, we have been in the habit of identifying our stock cultures by means of numbers. We will refer to these cultures in the tables by their numbers. A brief history of each culture used is given in table I.

Preparation of the Suspensions

Week-old cultures of the saprophytic bacilli which had been grown on glycerol-phosphate-agar were used as the source of material for inoculation. The heat-killed pathogenic bacilli were obtained from slant cultures approximately one month old.

The growths were scraped from the surface of the media into

TABLE I—*Brief histories of cultures used.*

DESIGNATION	NAME	HISTORY
1	*Mycobacterium graminis* 364	American Type Culture Collection. Originally from Prof. E. G. Hastings, U. of Wis., who designated it "Moeller's grass bacillus." In Prof. Hastings' collection for more than 25 years.
3	*Mycobacterium smegmatis* 101	American Type Culture Collection. Originally obtained from the Hygienic Laboratory, Washington, D. C. Their No. 178.
4	*Mycobacterium lymphangitidis*	Obtained from Dr. J. Traum, U. of Calif. Isolated by him from a skin lesion in a cow. [Traum, J: Jour. A.V.M.A., lv (1919), n. s. 8 (6), p. 639.]
7	*Mycobacterium stercusis* (Mist bacillus)	American Type Culture Collection, 1926.
8a	*Mycobacterium phlei* (Timothy grass bacillus)	Obtained from Prof. Hastings, 1928. His No. 74a. Obtained by him from Lister Institute Collection, 1925. Their No. 54.
22	*Mycobacterium berolensis* (Butter bacillus of Rabinowitsch)	Obtained from Lister Institute Collection. Their No. 524.
31	*Mycobacterium leprae*, Clegg I	Obtained from Lister Institute Collection, 1926. Their No. 512.
34	*Mycobacterium leprae*, Duval	Obtained from Lister Institute Collection, 1926. Their No. 358.
45		Bacillus from bovine lymph-gland. Isolated by ourselves, 1928.
49		Bacillus from soil. Isolated by Frey, in this laboratory, 1929.
54		Bacillus from soil. Isolated by Frey, 1929.
64		Bacillus from soil. Isolated by Frey, 1930.
77	*Mycobacterium cheloni* (Turtle bacillus)	Obtained from Dr. J. D. Aronson, Phipps Institute, Philadelphia, 1931.
79	*Mycobacterium ranae* (Frog bacillus)	Obtained from Dr. Aronson, 1931.
J.B.	*Mycobacterium paratuberculosis*	A strain of the Johne's disease organism, isolated by ourselves. In this study the organism was killed by heating the suspension at 100° C. for 30 minutes.
A.T.B.	*Mycobacterium tuberculosis* (Avian)	An old laboratory strain of the avian tubercle organism, killed by heating.
B.T.B.	*Mycobacterium tuberculosis* (Bovine)	A laboratory strain of the bovine tubercle bacillus, heat-killed.

small bottles, each of which contained a few cubic centimeters of sterile salt solution and a few glass beads. By shaking these bottles vigorously in a machine for ten minutes, fairly uniform suspensions were obtained. These suspensions were now poured into tubes and diluted until all were approximately of the same density. No attempt was made to approximate the number of bacilli present in these suspensions. However, they were fairly heavy, the opacity being of the order of that of a 24-hour culture of the typhoid bacillus in broth. Ten-cc portions of the suspensions were now placed in centrifuge-tubes and the bacteria thoroughly sedimented. After the fluid had been drained off, it was replaced by the same amount of sterile mineral oil. The shaking-machine was used to emulsify the bacteria in the oil. The final suspensions were milky white, and fairly stable.

Methods of Injection

The suspensions were injected into a series of large, healthy guinea pigs, three animals being used for each suspension. The injections were made subcutaneously (behind the shoulder), intramuscularly (right thigh), and intraperitoneally, respectively. A 1-cc dose was used for all animals.

Results

Of the 51 animals inoculated, 11 died and 40 were sacrificed. All deaths were due to the inoculations and not to intercurrent disease. The first death occurred on the 6th day after inoculation, others on the 9th, 10th, 13th, 18th, 21st, 24th, 29th and later. All of those dying with the infection, with two exceptions, received the dose intraperitoneally. All of the remaining animals were sacrificed between the second and third months.

Besides examining the organs for lesions, smears usually were made from the lesions, and cultures were made in many instances.

Local Lesions

Following intraperitoneal injection: Rapid emaciation occurred in all animals. In those which died after a few days, a considerable amount of cloudy fluid was found in the peritoneal cavity, and frequently some clear fluid in the thoracic cavity. Strings of fibrin lay between the organs, frequently plastered the spleen to the abdominal wall and festooned the liver surface. Great numbers of bacilli were present in these fibrinous deposits.

In those animals which lived longer, the fluid disappeared and definite tubercles were found here and there on the peritoneal surface. In the great omentum a mass of granulation tissue

usually appeared, and similar tissue frequently appeared on the surface of the liver, sometimes infiltrating parts of that organ. The spleen frequently became adherent to the body wall. In the granulation tissue foci of pus formation usually could be found, and such foci sometimes occurred in the pulp of the spleen. Occasionally large abscesses, filled with a thick whitish pus, appeared between the intestinal loops or elswhere.

FIG. 1. Lungs of guinea pig 913, inoculated subcutaneously with acid-fast 1 (*Mycobacterium graminis*), suspended in mineral oil. Died in an emaciated condition on the ninth day. Miliary tubercles in all lobes and caseation along the posterior border of the diaphragmatic lobes. Smears and cultures positive.

In those animals which lived for many weeks after the inoculation, tough fibrous adhesions replaced the masses of fibrin.

Following subcutaneous and intramuscular injection: Abscessation was the usual result of injection into the muscle or subcutaneously. Various amounts of thick, oily pus developed. In only a few instances did these rupture to the surface. Caseation usually was not seen at the injection site, although the neighboring lymph-glands frequently showed evidence of it.

LESIONS OF THE LUNG

Except when the injections were made intraperitoneally and there was involvement of the abdominal organs by direct ex-

tension of the disease process from the peritoneal surface, the viscera, excepting the lungs, never were involved. The lungs showed definite lesions in 41 of the animals, and a few doubtful ones in another. Lung lesions could not be detected in nine animals. None of the cultures, even the heat-killed pathogenic bacilli, failed to cause lung lesions in one or more animals. Therefore, it is safe to say that the pulmonary involvement is not due to any vital activity of the organisms but rather to

FIG. 2. Lungs of guinea pig 927, inoculated subcutaneously with acid-fast 8a (*Mycobacterium phlei*), suspended in mineral oil. Destroyed while in good physical condition on the 72nd day. Fewer but larger tubercles than those in the previous figure. Smears failed to show acid-fast bacilli. Cultures were not made.

their chemical make-up, and it appears probable that all acid-fast organisms will induce this peculiar reaction.

The severity and character of the lesions in the lungs varied greatly. In the most severely involved animals, usually those which died early, a considerable part of the principal lobes frequently were hard, dense, whitish, *i. e.*, necrotic. Sometimes the large lobes were thickly beset with pearly tubercles, the margins of the lobes usually being necrotic in these cases. In the animals less severely involved, pearly tubercles could be found

TABLE II—*Data on experiment I.*

ANIMAL	CULTURE	POINT OF INJECTION	TIME LIVED AFTER INJECTION (DAYS)	LUNG LESIONS	LUNG SMEARS	LUNG CULTURE
913	1	Shoulder	9*	+++	+	+
914	1	Thigh	58	+++	−	+
915	1	Intrap.	24*	+++	+	+
916	3	Shoulder	63	+	−	−
917	3	Intrap.	6*	+++	+	+
919	3	Thigh	63	+++	+	+
920	4	Intrap.	10*	−	−	−
921	4	Shoulder	67	+	+	−
922	4	Thigh	67	+	−	−
923	7	Intrap.	67	−	0	0
924	7	Shoulder	67	+	0	0
925	7	Thigh	67	+++	+	+
926	8a	Intrap.	72	+++	+	+
927	8a	Shoulder	72	++	−	0
928	8a	Thigh	72	++	0	0
929	22	Intrap.	18*	+++	+	+
930	22	Thigh	72	−	0	0
931	22	Shoulder	72	++	0	0
932	31	Intrap.	71	Doubtful	−	0
933	31	Shoulder	71	−	0	0
934	31	Thigh	71	+	0	0
935	34	Intrap.	71	−	0	0
936	34	Shoulder	71	−	0	0
937	34	Thigh	71	+	0	0
938	45	Intrap.	29	+++	+	+
939	45	Shoulder	88	++	−	−
940	45	Thigh	88	+	0	0
941	49	Intrap.	21	+++	+	+
942	49	Shoulder	89	−	0	0
943	49	Thigh	89	+	0	0
944	54	Intrap.	76	+	0	0
945	54	Shoulder	76	−	0	0
946	54	Thigh	76	−	0	0
947	64	Intrap.	88	+++	0	0
948	64	Shoulder	81	++	0	0
949	64	Thigh	88	+	0	0
950	77	Intrap.	13*	+++	+	+
951	77	Shoulder	67	+++	−	−
952	77	Thigh	67	+++	−	−
953	79	Intrap.	76	+++	+	0
954	79	Shoulder	76	−	0	0
955	79	Thigh	76	+	0	0
956	J.B.	Intrap.	68	+++	−	0
957	J.B.	Shoulder	68	+	+	0
958	J.B.	Thigh	68	+	+	0
959	A.T.B.	Intrap.	18*	++	+	0
960	A.T.B.	Shoulder	67	+++	−	0
961	A.T.B.	Thigh	67	+++	−	0
962	B.T.B.	Intrap.	68	+++	+	0
963	B.T.B.	Shoulder	68	+++	−	0
964	B.T.B.	Thigh	68	++	0	0

*Died as a result of the injection. All others were sacrificed.

here and there, usually lying just beneath the pleural covering. When only a few tubercles were present and the animal had lived longer, the pearly character was lost and the tubercles assumed an opaque, yellowish white appearance, because of caseation.

Great numbers of the acid-fast bacilli were demonstrated in the caseous tissue of the animals which died early, and these organisms could usually be demonstrated readily in the younger tubercles. In the older lesions they were demonstrable with difficulty or could not be demonstrated at all. Likewise, cultures were usually positive in the younger lesions and frequently negative in the older ones, although occasionally viable organisms were demonstrated in lesions which were seven or eight weeks old.

In table II an attempt is made to give the pertinent data on the experiment. Under the heading, "Lung lesions," + indicates that one to 10 or 12 definite tubercles were found; ++ that from 12 to 50 tubercles were present; and +++ that numerous tubercles, usually accompanied by caseation, were found. When smears and cultures were made, the result is expressed by + or —. When none were made, the fact is indicated by 0.

EXPERIMENT II

This experiment was similar to the preceding except that an animal fat (butter fat) was used for suspending the inocula instead of mineral oil, and a control series of guinea pigs were inoculated with the same organisms suspended in physiological salt solution.

Only two cultures were used, these being 8a and the heat-

TABLE III—*Data on experiment II.*

ANIMAL	CULTURE	NATURE OF SUSPENSION	TIME LIVED AFTER INJECTION (DAYS)	LUNG LESIONS	LUNG SMEARS	LUNG CULTURE
1096	8a	Oil	21	++	+	—
1097	8a	Oil	16*	+++	+	+
1098	8a	Oil	21	+	—	—
1099	8a	Aqueous	21	—	0	0
1100	8a	Aqueous	21	—	0	0
1101	8a	Aqueous	21	—	0	0
1102	A.T.B.	Oil	2*			
1103	A.T.B.	Oil	21	+	0	0
1104	A.T.B.	Oil	21	+++	+	0
1105	A.T.B.	Aqueous	21	—	0	0
1106	A.T.B.	Aqueous	21	—	0	0
1107	A.T.B.	Aqueous	21	—	0	0

*Died of intercurrent disease.

killed avian tubercle bacillus. Six guinea pigs were injected with each of these organisms. In each case three animals received the aqueous suspension and three the fat suspension. The dose of organisms was the same in all cases. The organisms were prepared for injection in the same way as in the first experiment. All injections were made intramuscularly, the right thigh being used as the injection site.

The essential data of this experiment are given in table III. It will be seen that none of the animals injected with the aqueous suspensions developed lung lesions, whereas all of those receiving the fatty suspensions did, excepting one which died the second day after injection from intercurrent disease.

DISCUSSION

It is obvious that acid-fast organisms are disposed of differently, when they are deposited in the tissues mixed with a fat, than when they are suspended in an aqueous medium. This difference is reflected in the fact that tubercles are produced in the lungs in the majority of cases, no matter where the bacilli are introduced, in the former case, and seldom, if ever, in the latter. The phenomenon is not a vital one, inasmuch as it occurs when heat-killed organisms are injected.

In 1924, Mudd and Mudd[5] showed that when tubercle bacilli and other acid-fast organisms suspended in an aqueous medium were brought in contact with an aqueous-oil interface, the organisms passed through the interface into the oil. Non-acid-fast organisms remained in the aqueous phase. Their studies were carried on with the dark-field condenser and the actual behavior of the bacilli watched. Reed and Rice[6] confirmed the observation and showed that a large proportion of the acid-fast bacilli in an aqueous suspension could be removed by shaking the suspension with oil, and then allowing the oil to separate. The bacilli, having entered the oil phase of the emulsion, separated with the oil. Non-acid-fast organisms, whether Gram-positive, or Gram-negative, whether capsulated or not, remained in the aqueous phase.

The mechanism of this reaction is too complicated to be discussed here, but, in simple language, the phenomenon depends on the fact that the acid-fast organisms differ from all others in that their surfaces are more readily wetted by oil than by water, presumably because of a fatty layer on their surfaces.

In the emulsions of acid-fast bacteria used in this study, therefore, most of the individual bacilli were surrounded by blankets of the oil, or, in other words, lay within globules of

fat. In this position they are probably protected from the tissue fluids and cells, whereas, the bacilli in aqueous suspensions are directly exposed to these influences. It seems probable that the protected bacilli are able to pass the lymphatic filters more readily than the others and thus reach the bloodstream.

Ravenel[7] and Ravenel and Reichel[8] have shown that tubercle bacilli pass through the intestinal wall readily when they are administered with cream or butter. Lung lesions could thus be produced without there being anatomical evidence of the fact that the bacilli had entered through the bowel. It is probable that the mechanism of this phenomenon is the same as that by which lung lesions are induced by the saprophytic bacilli.

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New Milk Ordinance for Olathe, Kansas

Four cases of undulant fever in Olathe, Kansas, and vicinity, the past year, were the immediate cause for the adoption of a new milk ordinance for Olathe, which went into effect in October. Dr. S. L. Stewart is credited with having written the new ordinance which was sponsored by the Olathe Raw Milk Producers Association, organized in July. Dr. Stewart was the leading spirit in the formation of the organization.

The principal purpose of the new ordinance is to provide for producing clean milk and delivering it to the consumer clean. The dairymen and city authorities are relying principally on education for popularizing the ordinance.

Members of the Olathe Raw Milk Producers Association hold weekly meetings and they are striving to produce the best milk sold in Olathe. Milk sold by members of the Association carries the name of the Association, as well as the name of the dairyman, on the bottle-cap. Members are required to produce grade A milk.

Dog Population of Mexico City

There is one dog for every two persons in Mexico City, according to a recently dog census. The local Health Department reported 500,000 dogs, 973,299 persons.

THE RELATION OF THE VETERINARY PROFESSION TO MUNICIPAL MEAT INSPECTION*

By E. D. KING, JR., *Valdosta, Ga.*
Board of Health

To state accurately the relation of the veterinary profession to municipal meat inspection would require more information than the writer has at this time, but with what information is available, it is hoped to induce the profession to collect other data and, if this justifies such action, make meat inspection available on as nearly a universal basis as possible.

Veterinarians are learned in the pathology, diseases and parasites that are common to man and animals, and thus responsible proportionately that this training be used to protect the public health, and promote the production and sale of meat products.

This training, given in the veterinary colleges, specially equips the graduates to function as guardians of the public health from animal parasites and diseases and, while less spectacularly than policemen and firemen, they are no less exposed to the dangers of diseases and parasites than firemen and policemen are exposed to fire and attacks of criminals.

Since the veterinary profession has the greatest number of trained men in this special work, its relation to the meat inspection service at once becomes closer than any other group, as exemplified by the excellent meat inspection service of the U. S. Bureau of Animal Industry that is entirely directed by veterinarians and which maintains the most efficient meat inspection service in the history of sanitary science.

The service of meat inspection is usually the first to detect diseases and parasites in dangerous proportions and this information can then be used by live stock sanitary officials and practitioners in taking immediate action to prevent losses.

The reduction tank that should be in use at all slaughtering establishments conserves material that is usually wasted in outside slaughter (greases and fertilizer tankage), destroys disease germs and parasites, their eggs and larvae, and has evidently improved live stock health (in one instance) by reducing the amount of viscera condemned for parasitic infestation.

There is no good reason to go into much detail on this subject, as you all know and can visualize the development of each item mentioned above. Let us summarize the subject as follows:

*Presented at the sixty-ninth annual meeting of the American Veterinary Medical Association, Atlanta, Ga., August 23-26, 1932.

Meat inspection is primarily a veterinary function to protect the public health.

The veterinarian is better trained for this service than any other scientific man, hence his duty and responsibility require that he cultivate and occupy this field.

The live stock industry is afforded additional protection by this service, by the early detection of diseases and parasites, and the success of the live stock industry is our main objective.

The tanking of offal destroys many parasites and disease germs and thus improves the live stock health, as well as conserving valuable fertilizer and greases that are wasted in outside slaughter.

There being only one aristocracy left—that of service to our fellow man—let us qualify for membership in this aristocracy by rendering this service, whenever and wherever possible, and as the poet would say:

> Let us live in a house by the side of the road,
> And be a friend to man.

My suggestion would be to bring this subject to the attention of the various agencies that are interested or responsible, through the American Veterinary Medical Association, to include the state associations, the United States Live Stock Sanitary Association, state veterinarians and colleges, with a view to selling this service to the profession and through them to the public.

The plan of propagation and education of the public may be determined after the views of the various agencies have been obtained.

Discussion

Dr. J. V. Knapp: I would like to say this in regard to Dr. King's paper and his appearance on the program: He is the exponent of municipal meat inspection in the Southeast and, as he said, this is his hobby. He wants to see municipal meat inspection in every city and town in the United States, with a veterinarian as meat inspector. He wishes to get the story across to every veterinarian and to the public at large, and, in other words, to sell the idea first to the veterinarian and then to the public at large, that this is an economic necessity as well as a public health measure. I would like him to talk on that part of his subject, if he would.

Dr. King: Gentlemen, the selling of the idea of meat and milk inspection to the public is a thing that fascinates me like fishing does some other people. If you go out to the outside slaughter places, when the inspector goes to the municipality to render meat and milk inspection services—pardon me for bringing the milk in because in my case they are tied together—the first butcher you come to will say, "Doctor, come out and I will show you how nice I keep my place. You can put your stamp on it and it will be all right." "All right, thank you," but I stuck a camera in my hip pocket. I snapped a picture of the first place I came to. Then we went down to the stable, where the

fertilizer was about knee deep. He had several cattle in the lot and drove them into the stable. He shot one, and down it went. Everybody went in and went to skinning and cutting up. They rolled its head out of the door. There was an old board to hold back the contents, so its hide and neck wallowed right down on that. I got back a little bit further and I took a picture. And later I took a picture of the carcass hung up.

Then this butcher took me out again and this time we used a limb of an oak tree to hoist the carcasses up. We killed several cattle under it and left blood and offal on the ground under it. In a few days it rained, and the next day we used this limb for a hoist, but this time we had trouble. Larvae of the blow-fly (*Calliphora vomitoria*) had been forced by the water on the ground to hunt higher quarters and so used our tree and limb. They made it as sleek as a ball-bearing lubricated with high-speed grease, and when the rope was put over and traction applied, it skidded down to the body of the tree and raked off many maggots onto the carcass. They continued to fall on it after it was skinned.

That was photographed, and many other such scenes over a period of months and years, after which the idea of making stereopticon slides was suggested. Then some bright market man suggested the idea of inspecting the meat in the market (without any viscera) and this was done for a month with the net result that I had "looked at" 36,000 pounds of meats in one month. Our inspection service now handles more than 1,500,000 pounds of meat a year. This would suggest that we did not *see* all of it, but (it was argued), "the butchers know good meat when they see it," so we responded to calls such as "Come here, I have a cow down here," which meant a dressed one *sans viscera*.

This was all changed in 1923 and we now have a sanitary abattoir and assistant lay inspector. Our inspection covers more territory and we think we are useful from a public health standpoint. One stockman said the increase in sales was worth $10,000 a year to local stockmen (increasing from 850,000 pounds in 1925, when we got the first full year's record of meats passing our inspection to 1,622,000 pounds in 1931).

Ladies now examine parts of carcasses for the stamp, and wildcat meats are rare.

But, to go back to the educational work. They began to take the camera as a matter of course, and some said, "This fellow is all right," meaning that a surgical dose of anesthetic was believed to have been applied to my ambition to reform the meat supply.

But one day the Mayor expressed a desire to do something for the Health Department, and the acquisition of a stereopticon and the making of some slides was suggested to him, which he had me recommend to the Mayor and Council, with the result that they wouldn't let me make a speech but gave me the appropriation, increased by 10 per cent over my estimate, to escape the speech and promote sanitation. Slides were made and we changed the complexion of our meat supply.

Now if you are sold on your subject, there is not enough sales resistance in these depression times to stop you. You can sell it to the other fellow.

When the veterinary profession gets to that stage of enthusiasm, it needs little else to make meat inspection available everywhere there is a man competent to do it, as enthusiasm breaks down barriers and convinces and dominates like nothing else. It is this motive power that we need.

We are turned out of college with all the scientific training necessary to differentiate a safe from a dangerous carcass, but in salesman-

ship and evaluation of veterinary science we are sadly in need of ammunition. This is readily obtainable from a dozen sources, if we will go after it.

There is always a colleague ready to take you by the hand and lead you step by step through the problem if you will only ask it. Go to the killing-floors, state veterinarian's office, college or B. A. I., but never get the habit of depending too largely on others in the interest of your self-confidence. Keep before you the fact that meat inspection is important from the standpoint of public health, the development of the live stock industry, and the sale of animal food products. Cultivate enthusiasm, and nothing can stop you. "The world gets out of the way of the man who knows where he is going."

DR. C. H. STANGE: How about federal inspection of meat?

DR. KING: This has been referred to in my paper as the most efficient food inspection service known to sanitary history. The federal service inspects about two-thirds of the meats in the country and the other one-third is under all kinds of supervision, from none at all to those services that try to equal the B. A. I. service as nearly as possible. Many communities where there is no inspection get the animals that an unethical dealer would be afraid to have inspected.

Permit the observation that the carcass is the most important consideration in meat hygiene, as odor and appearance will betray putrefaction, but a qualified veterinary inspector should have opportunity to see the animals before, during and after slaughter, and this, where both market and meat inspection can not be done, is the best way to give the maximum of health protection.

Abortion "Cure" Gets Shipper in Trouble

Interstate shipment of a yellow solution consisting of water, but containing some carbolic acid, table salt, chlorin and sugar, and recommended as a remedy for contagious abortion of cattle, cost John W. Froberg, of Valparaiso, Ind., a fine of $200 and costs in the federal court for northern Indiana recently. The U. S. Food and Drug Administration alleged that the preparation was falsely and fraudulently labeled under the federal Food and Drugs Act. Froberg, under the name of Dr. W. A. Bozarth, shipped the fake abortion remedy to consignees in Fond du Lac, Wis., and Armington, Ill. The government seized consignments of the goods and Froberg pleaded guilty to the charge of misbranding. Several farmers declared that they had used the article ("Cow-Calf Compound") in their herds without success. Leading veterinarians declared that a preparation of this composition could have no beneficial effect in the treatment of this serious disease of cattle.

Premium for Pugs

Seven of the characters in A. S. M. Hutchinson's novel "Big Business" are pug dogs. The publishers, thinking the species was rare, offered a free copy of the book to pug-owners. So far three New Yorkers have claimed copies.

MUNICIPAL DAIRY INSPECTION*

By W. D. MARTIN, *Albany, Ga.*

In the early ages, where men were living together, destruction by disease was going on. This destruction continued, and was looked upon as a sort of visitation of the wrath of God, until after the scientific discovery of the compound microscope near the middle of the nineteenth century. This discovery gave to man a weapon with which to combat a foe that previously had been hidden. From this period, progress was very rapid in finding out the causes of disease and the modes of transmission. Specific causative organisms were isolated, giving to man an exact knowledge of contagion. The knowledge thus gained soon brought milk into the arena as a spreader of disease, but it was not until the early 80's that definite evidence became available to incriminate milk in the transmission of infections. This evidence has been enlarged gradually and progressively, until today it is possible so to regulate the production, handling and distribution of milk that there will exist no danger from disease, spread either from animal to man, or from man to man, through the agency of milk.

Outbreaks of destructive disease among men have caused the governing bodies of cities and of states to place around the production of milk very rigid protective fences. These protective agencies called *laws* have very little influence on the quality and purity of milk unless they are placed in the hands of competent and qualified men to enforce. I do not believe that anyone is more competent to administer regulations governing the handling of milk than is the graduate veterinarian. Certainly he has the training, he is familiar with the anatomy of the cow, and he should be familiar with all the diseases that are transmissible through the medium of milk.

The qualifications of an officer to enforce regulations governing safe milk are not, in my estimation, only those pertaining to the proper and safe handling of milk, but he should be familiar with every phase of its production, and have a definite knowledge of the dairyman's problems. To gain the confidence of the producer will mean that the sanitary officer will receive the fullest coöperation from the producer. The acquirement of his confidence may be accomplished in many ways. A study of human nature and of the producer's most urgent needs will largely be

*Presented at the sixty-ninth annual meeting of the American Veterinary Medical Association, Atlanta, Ga., August 23-26, 1932.

the determining factor. The inspector may be able to help the producer with his feeding problems or with methods that will afford him greater convenience, or he may be of assistance in helping him to cull his herd to get rid of boarders and non-profitable animals. The inspector may be able to teach him how to convert a waste of skim milk into a profitable cultured milk, or to convert all of his skim milk into a tasty cottage cheese. It might well be said that a diaryman who cannot make money is one who is hard to sell on sanitation. It is my personal belief that we should sell the dairyman on sanitation. If that cannot be accomplished, then it should be given to him with all of the law and in rapid succession. Ordinances drafted to regulate the production and sale of milk should not be of such voluminous content that the dairyman cannot understand them. He should be as able to interpret their meaning as the inspector.

In discussing municipal dairy inspection I can discuss it only from the angle where I am engaged at the present, at Albany, Georgia. Our little city of 15,000 people, located in the southern section of the State, presents problems that your city possibly will not have. Local conditions present themselves as problems in every section that attempts to regulate dairies and milk.

Barn Construction

Milk-barns should be located with respect to drainage. The lots must be so arranged that they do not become quagmires and havens of infection, to be carried into the barn and delivered to the milk from the cow. We allow no barn to be constructed until after the location has been approved by the dairy inspector. Consideration is given to the surroundings, such as the distances to hog-pens, mule- or horse-barns, pit privies, stagnant pools, chicken-houses, and sleeping-quarters for cattle. We have adopted a regulation width, divided as follows (single-stanchion barn): Back to front, 48-inch walkway behind cattle; 4-foot 8-inch or 5-foot platform; 42-inch feed-trough, and 42-inch feed-alley in front of cattle.

The barn floor and ground base for building must be constructed of concrete, or brick covered with concrete. The ground base must be 12 inches above the inside floor-level at its highest point. This is finished with smooth concrete. The floor has a pitch of 1/10 inch per foot lengthwise, or a one-inch fall for each ten feet, which readily carries away the water. The cross-section is a graded platform with a 4-inch fall from stanchion-tie to the rear end. There is an abrupt drop of 4 inches at this point, with a gradual rise of 2½ inches in the four feet to the wall. A floor

of this type is more readily cleaned and with an expenditure of less labor than any type of floor with which I have had experience.

No depressions are allowed in the floor, to hold water after washing. To me, the floor of a dairy barn is very important and much care should be exercised during its construction. Poor concrete means that cracks will appear and if cracks are allowed to remain, barn odors are sure to be present.

All of our milk-barns measure 16 feet, inside dimension, with a minimum allowance of 3½ feet per cow, 400 cubic feet of air space, and 5 square feet of light admittance, exclusive of doors, per cow. No buildings are allowed to be attached to the dairy barn and no loft is allowed above. Old barns that do not meet the above requirements are not allowed major repairs. Therefore, they soon are replaced with a regulation barn. The type of barn built gives us very little concern as long as the ceiling is kept at such a distance that it can be brushed and washed readily. It must be of dressed material.

The milk-room must be located not less than 10 feet from any part of the milk-barn and must not be connected with it, but must have a free passageway for air between it and the milk-barn. The equipment should include a steam boiler, the capacity of which should be determined by the inspector, and a concrete or brick sterilizer of sufficient capacity to allow all bottles, buckets and other utensils used during one milking, to be placed in it at one time for steam sterilization. The boiler should be of a capacity that will permit raising the temperature to 205° F. and holding that temperature for 45 minutes. Other equipment that is ordinarily found in rooms for handling milk should be provided.

Keeping the Cows Clean

As the cows are placed in the barn, the flanks, sides and tail are groomed with a brush. If the feet or any other parts of the body are soiled, a hose is used. After being brushed, the cattle are washed with a hose, and the udder and flanks are dried with clean cloths. Some experienced member of the milking crew tries each teat before milking begins. If swollen quarters are found, the cow is turned from the barn. This is to prevent some careless milker from accidentally starting to milk her. As each fish-mouth bucket is filled, it is taken to the milk-handling room and immediately cooled to 50 degrees or below. We allow milk to be strained but once and through but one cloth. This is a precautionary measure and not to get out any dirt. Dairymen are sometimes punished for violation of this regulation, their

punishment being the loss of the milk. The inspector takes the position that if they are desirous of laundering it, the milk is dirty and is not fit for human consumption. Sediment in milk is checked closely and, I believe, held to the minimum from this straining procedure. I do not hesitate to pour out the milk found in the bucket of a milker with dirt under his or her fingernails, or of one milking with a cigarette in his mouth. No milk is allowed to be poured in the milk-barn, and when delivered to the milk-handling room it must be poured over the cooler and not allowed to stand until it is convenient for somebody to cool it.

The helpers and milkers are required to have health certificates, issued by the City Physician. The examination for the certificate consists of a physical examination and the drawing of blood samples for the Wassermann and Kahn tests for syphilis. The urine and feces are sampled regularly. Suspicious and positive cases are removed until cured, and then further tested. Cattle are regularly tested for tuberculosis. This test takes place annually, unless reactors are found. Then they are tested at 60-day intervals until the herd passes two negative tests. Then they receive a test at the expiration of six months. All new cattle are tested before being admitted to the milking herd.

Washing and Handling Bottles

Bottles are very important, as the milk must remain in them for a longer period than in any other container. The washing should be done by an experienced man. Contrary to this belief, most dairymen are prone to place any new help at bottle-washing, in order to break them in. This should not be allowed. Much attention should be given to the kind of detergents that are used. Soap or soap base powders are not allowed to be used in any dairy in Albany. This regulation is enforced by taking the milk off the market when the regulation is violated. After being washed and rinsed, the bottles get their bath in steam for 45 minutes. The bottles remain in the sterilizer until used. Chipped and broken bottles are discarded. We allow the use of chlorin agents as an adjunct to sterilization, but on no condition do we allow the elimination of steam.

There have been occasions when it became necessary to check up on the sterilization of utensils and bottles in the sterilizing cabinet. This is done by placing a small bottle of chlorin solution in the sterilizer. After the sterilizer has been partly filled, if the remaining fluid shows very little or no chlorin upon my return before the next operating period, it is evidence to me that no heat has been applied. On several occasions paper notes have

been left in the boiler, or some small part of the boiler removed. If, upon my early return, the part removed has not been replaced, I am reasonably sure that no steam has been used either in washing or in sterilizing.

On one occasion, soon after I took over the supervision in Albany, I had to exhaust all resources in order to find the operator at all of his tricks. One was to make up milk shortage by using milk powders. This was not done at the dairy but at his home in town. As the city supplied its own power, I asked the city electrician to pull a fuse in the transformer and not answer any calls until this man put in a call for service. It was first determined that he was at home and that the lights were on. A complete inspection of all closets, by the electrician, disclosed that milk bottles, pails, powders, and a 10-gallon electric churn were in his home. He was confronted with this information and we had no further trouble from that source.

Delivery of Milk

No milk is delivered in bulk except to the ice cream and pasteurizing plants. All cooking milk delivered to bakeries, hotels, cafes and other places is delivered in bottles. Milk delivered to hotels, cafes and other eating places, intended for consumption as milk, is delivered in 8-ounce bottles, and is served from them only.

Pasteurized Milk

Our ordinance is not opposed to the pasteurization of milk, but does prevent milk of a lower grade than A being raised to A through pasteurization. To me it is fundamentally wrong for a low-grade milk to pass through the pasteurizing chamber and then be capped "Grade A Pasteurized." All milk passed through the pasteurization plant in Albany is milk that can be sold as Grade A raw milk. Dairies built to supply this plant were required to meet Grade A specifications. I take the unalterable position that it is as easy and no more expensive to produce Grade A milk as it is to produce milk of a lower grade and be safe. The things that go to reduce grade usually are dirt, bad surroundings, poor methods, etc. So, if a dairyman's milk is of a lower grade than the A standard, he cannot stay in business. My paramount duty is to protect the health of milk-drinkers. This cannot be done by allowing a lower grade milk than A to go on the market.

Keeping in touch with the physicians, especially those having a considerable baby practice, serves to keep me posted as to the milk supply, in a measure. Physicians tell me that their cases

of bowel troubles have been reduced 75 per cent within the last four years.

We have no laboratory in Albany for checking our milk. We depend only on samples sent to the State Board of Health laboratory and all of you know that a laboratory so far away and with so much work to do cannot check a city's milk supply. A laboratory is of untold value in checking a milk supply and I think that every city should have one. But all milk supplies cannot be checked or controlled through a laboratory. Therefore, some of us must do the best we can, but under no conditions should we take chances.

In the city of Albany the Health Officer is charged with many duties aside from milk inspection. These other duties take much time, but at no time do I allow anything to take me from my dairy work. A large part of my dairy work is done early in the morning and late in the evening. I visit my dairies but little, except during their working hours. To do this requires much work in the early hours of the morning. A dairyman producing milk under my supervision expects me just as often at 1 o'clock in the morning as at the same hour in the afternoon.

Fly Control

Most folks seem to expect flies at dairies or other places where live stock is kept. It is not so at our dairies. Dairymen are taught methods by which flies can be controlled and if they fail to use those methods or others as effective, they are eliminated from the list of permitted dairies. My usual practice is, after a warning, to suspend the dairyman's operations for 4 to 8 days, giving him time to clean up and rid his premises of flies. If that fails, his permit is revoked. Of several permits revoked, not a single permit has been reissued. I try to be fair when revoking the permit of a dairyman. I first warn his banker, his feed man, and others with whom he has credit. They talk to the dairyman and if he continues to be careless, his permit is revoked.

Even as hard as times are today, our milk consumption is more than 60 per cent greater than it was in 1928, when times were much better than now. The price today is much less and, of course, this has increased the consumption some, although at the present price of milk, if conditions were normal, our consumption would be double that of 1928, the year that I assumed supervision of the milk supply at Albany.

Discussion

Dr. B. E. Carlisle: In my opinion this paper is very creditable. There are many things to consider, which applies also to the paper by Dr. King. The rendering of a service to your municipality, to its

citizenship, to the public, to public health, in connection with meat and milk inspection and their relationship to the public health, has been brought out by Dr. Martin and Dr. King, as well as their relationship to public economy in the community. Many times we carry on milk and meat inspection in a manner that would not convey the right idea to those for whom it is beneficial. I know of a recent instance where the distribution of milk from a dairy was suspended, and the general public got entirely the wrong idea as to why that milk was banned. The dairy was suspended by the public health officer because there was a case of typhoid fever in the immediate vicinity. Well, it is really surprising to know how many people got the idea that the case of typhoid fever came from the milk. I blame the health officer who sent out the notice and his manner of handling the thing for getting this wrong impression over. Now, that did harm that it will take a long, long time to rectify. It stopped many people from using milk and some will probably never use any more milk. Now, that does two harms, harm to the children who are consuming the milk, and to the grown people whose physical condition is such that it demands the use of milk as a food. And then it does harm to the individual dairyman supplying the milk. It does harm generally, economically; does harm to me because I get something out of that dairy; does harm to the feed man, to the banker. You see how it goes around.

I know some of you live quite a long way from Albany, Georgia, but in the last few years Albany has received a great deal of favorable publicity. It has been able to reduce its taxes; its debts are paid, and it is generally in good financial condition. That is known all over the country. I think there is only one city in the United States of its size that compares favorably with Albany, in that respect. Albany has come to the attention of many of you, no doubt, because of the fact that it has the lowest fire loss, possibly, of any city in America. Time after time it has been awarded the medal for the low fire loss. As a consequence, their fire chief is the president of the International Association of Fire Chiefs, and he goes all over the country lecturing on fire prevention.

Albany enjoys another distinction. In my opinion it has one of the most practical health inspectors. He has told you he has under his supervision a great many men of the Public Health Service. He renders a service there that the dairyman soon sees. It is valuable to him, and he increases that dairyman's income because he turns over to him ideas that are practical and workable, and the dairyman is sold on his service. He wants his service. The public is sold on that service because they are sold on the idea that they are getting good, wholesome, dependable milk. Whenever you go into meat inspection or milk inspection or any public health work of that type with the idea of driving it, you are not going to accomplish anything.

Probably some of you are connected with this work in larger cities, and your publicity has to go over in a different way from what it does in a small town. In a small town you have individual contacts, a little bit of publicity, and talk to the authorities through whom the ordinances and regulations have to come, or by whom they have to be enacted. I have no trouble in getting any ordinance that I want because I never ask for one that is not reasonable. You have to be reasonable with the public and reasonable in your ideas. You have to make the public want it; you can not make the public swallow it. That is the wrong attitude.

Dr. King has entered into an educational program, and the people know what he is doing all the time. He passes it on to the public. Dr. Martin has done the same thing.

Now in regard to the manner in which the public health physician put over his proposition, stopping the sale of milk from this dairy. Of course it had to be done; it was right, but the manner in which he did it was entirely wrong. One of these gentlemen would have handled the proposition in such a manner that the public would never have gotten the idea that the milk was responsible for anything. Of course we understand that the milk could have been a carrier, but they got the idea that the milk was responsible for the origin of the human illness, and it did a great harm. This is the kind of work that Dr. King and Dr. Martin are doing—they are educating the public and educating the producers to the necessity and the value of this work, and it just takes better and better all the time, and they are rendering a service to their communities and a service to humanity and a service to public health and an economic service that is really very, very valuable.

DR. C. A. CARY: It is a prevalent idea, especially among many city officers and health officers in the different states, that anybody can do any and all kinds of meat and milk inspection. There are too many places in the country where laymen, M. D.'s, dairymen and others are in this business. At the clinic on Friday we are going to have a very useful demonstration. Dr. Udall is going to give you a practical demonstration of the inspection of udders. Now, a good many of you think that is simple. I heard him say the other day how many hundred cows he had to practice on before he learned the technic and acquired the ability to inspect cows' udders. I am one who believes that meat and milk inspection is solely the function of the veterinarian and that it takes a qualified veterinarian to do it, and I hope that the time will come when there will be no city, no state, or other political organization in this country that will employ anyone but graduate veterinarians to do the inspecting.

DR. S. L. STEWART: Milk inspection in a large city is a different problem from what it is in small cities, because you have so many people to contend with in the larger places. Your educational proposition is an entirely different one from what it is in smaller places. I was very much pleased when I heard Dr. Carlisle say that milk and dairy inspection is an educational proposition. The idea seems to have been broadcast in the past and still exists in some places that an ordinance is passed and milk inspection is started by force and not as an educational proposition. I do not think it can be put over any place satisfactorily when it is put over by force. It must be put over in an educational manner.

A man who gets to the top of the ladder must climb the first rung, and you can not make a sanitary dairyman out of a dirty dairyman without educating him along the proper lines for the production of sanitary milk. I was very much interested to know that Albany, Georgia, has only one grade of milk, and that is a Grade A raw milk, and that if they want to pasteurize the Grade A raw milk, that is the pleasure of the dairyman. We are not able to enforce that regulation. We have what we call Grade A raw milk and Grade A pasteurized milk. The Grade A raw milk must not contain over 10,000 bacteria per cubic centimeter, and our milk for pasteurization must not contain over 50,000.

I was very much interested in the statement that seventy-five per cent of the bowel trouble in children had been eliminated by using sanitary methods in producing milk. I think that you will find that correct in nearly all cities where milk ordinances are properly handled, where you are actually honestly producing a good milk. If it did not do anything else, that is certainly worth while, because children must have milk, and if you can eliminate seventy-five per cent

of the bowel trouble in children, you have done a most wonderful thing.

When it comes to the agglutination test for abortion, I think, especially in raw-milk herds, reactors should be removed. But from a health standpoint, the number of people who contract undulant fever is so small that it is not in a class with bowel troubles in children. Only one person in 90,000 contracts undulant fever from cows. Of course that is a secondary problem, but we are trying to eliminate those cows from our herds as fast as we can without bankrupting the dairymen.

Infectious abortion (Bang's disease) is principally and primarily a live stock problem, and in my judgment it should be treated as such, but when the disease seems to open the gates for entrance to possibly several other conditions or diseases, especially purulent metritis and bad udders, mastitis of several kinds, infectious abortion then becomes a serious health problem. But even then the physical examination of cows will eliminate most all cows with dangerous udders and cows with purulent metritis.

Taking all these into consideration, it leads one to believe that through educational features is the only way to arrive at a good, safe, sanitary milk.

Nebraska's Mousetrap Law

Among the statutes on the books in Nebraska is one that has been dubbed the "mousetrap law." It prescribes the modus operandi for counties wishing to secure or abolish the office of county agent. Here is the way it works. In a county of 10,000 population, 275 farmers may sign a petition for the creation of the office of county agent. (In smaller counties, 100 signatures would be enough.) The petition, properly signed and filed, is mandatory on the board of county commissioners to establish the office, pay the salary and expenses of the county agent (averaging $3,500 per year in addition to approximately the same amount paid by the federal government) and spread the cost among *all* the taxpayers in the county.

Now, let us see what is necessary to "get out." In a county of 10,000, a petition for the *privilege of having a chance to vote on the question* must be signed by 370 bona fide farmers. No farmer who signed the petition for creating the office of county agent may sign the petition asking for the submission of the question to the voters. The law will not let a signer of the original petition "change his mind." However, newspaper reports available indicate that some Nebraska counties "changed their minds" at the recent election, when the question of abolishing the office of county agent was put up to the voters. In Red Willow County the vote to abolish was 2,614 against 2,408 to retain. In Madison County, 6,560 voted to discontinue the office and only 3,354 voted to continue it. In Thurston County, the vote to do away with the county agent was more than 2 to 1.

SO-CALLED RANGE PARALYSIS OF THE CHICKEN*

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Studies were initiated on this problem at Iowa State College, February 26, 1930, as a coöperative project between the Poultry Husbandry Section and the Veterinary Research Institute. The apparent increasing importance of this disease prompted these studies. In the beginning, we were primarily concerned with the nerve and eye types, which seemed to be different expressions of the same disease, but very early in our investigations we were forcefully impressed by the frequent occurrence of tumors and tumorous-like infiltrations in various other organs and tissues which appeared to be fundamentally the same as the lesions which were found in cases of so-called range paralysis. Later, their close association with leukemia and erythroleucosis-like manifestations became very apparent. For these reasons we felt impelled to study these various expressions along with the primary ones under investigation. This accounts for what might seem a digression from the initial subject.

Due to the lack of time and space, a review of the literature has been omitted. However, a bibliography is appended. For the same reasons, the studies on myeloid leukemia and erythroleucosis and on the bone-marrow and blood have been only briefly summarized. More complete discussion of these is reserved for a future paper.

MATERIALS

Table I conveys a fair idea of the frequency of occurrence of the lesions of this disease in the various organs and tissues. The bone-marrow figures are probably low, because this tissue was not examined in all cases, especially those in the earlier experiments. The figures recorded as miscellaneous indicate lesions such as tumors in the skin, muscle, and more or less independent tumorous growths in the body cavities; myelocytomatous infiltrations along the ribs, between the cartilaginous walls at the apex of the sternum, and elsewhere. Lesions in the brain and spinal cord would probably have been found more often had microscopical examinations been made of them in all cases.

*Coöperative paper of the Veterinary Research Institute and the Poultry Husbandry Subsection of the Iowa Agricultural Experiment Station, Journal Paper No. B72 of the Iowa Agricultural Experiment Station, Ames, Iowa. Presented at the sixty-ninth annual meeting of the American Veterinary Medical Association, Atlanta, Ga., August 23-26, 1932.

TABLE I—*Data on cases studied and distribution of lesions.*

Chickens used in these studies	1240
Chickens autopsied	754
Positive cases autopsied	445
Cases clinically positive but not autopsied	99
Total positive cases studied	544
Positive cases upon which histological studies were made	267
Positive cases upon which blood studies were available	229
Positive cases showing positive leukemic or erythroleucosis blood pictures	102
Positive cases showing negative blood pictures	127

Birds showing positive manifestations in the following locations:

ORGAN	CASES	ORGAN	CASES
Eye	242	Ceca	10
Nerve	158	Mesentery	13
Liver	162	Pancreas	18
Kidney	94	Parathyroid	1
Spleen	84	Bone	4
Bone-marrow	77	Ureters	2
Ovary	47	Adrenals	6
Heart	47	Blood-vessels	3
Lungs	28	Testes	12
Brain	24	Gall-bladder	1
Spinal cord	14	Cloacal gland	1
Thyroid	21	Head sinus	1
Thymus	11	Oviduct	2
Intestines	19	Miscellaneous	36
Proventriculus	28		

The blood-vessel figure does not represent the many vessels and capillaries found involved in affected organs, but represents grossly involved large vessels such as the femoral artery, for example. Clinical studies were made on most of the 544 positively diagnosed cases. In some cases the observations were for a brief period, while in some others they were for periods of a year or more. Clinical studies were made on a considerable number for comparatively long periods of time.

Of the 1,240 chickens used in these experiments, 952 were secured as baby chicks, the majority of which were hatched at the College for this special purpose. There were 288 that came from 35 different outside sources. The disease was positively diagnosed in one or more birds from each of these 35 groups.

CLINICAL STUDIES

The symptoms observed in the nerve-type cases varied according to the location and degree of involvement of the nerve tissue affected. This type may be observed as a unilateral, bilateral,

local or general paralysis. The manifestations may be very slight or so severe that the fowl is practically helpless. Lameness in one or both legs, and the sagging of a wing, are probably the most common symptoms observed. Sometimes the following characteristic manifestations are observed when the legs are involved: affected leg or legs extended backward, forward or straight from the body, or one leg may be extended backward and one forward; walking in a stilty manner; stiffness; limping on one leg. The bird may go completely down and drag itself about, assisted by its wings.

Difficult respiration (breathing through the mouth) has been observed and in some cases was associated with the involvement of the vagus nerve. When the brain is affected, various abnormal head movements may be noted, such as a weaving motion of the head; or various deviations, such as throwing the head backward or drawing the beak downward; lateral deviations, and so forth. Lethargic symptoms also have been observed when the brain was involved. The onset may be gradual or may appear suddenly. The course is very variable, and the disease may be rapidly progressive or may progress slowly. Some cases will apparently remain in good health except for a local paralysis for a long time.

The appetite generally is retained throughout the course of the disease. Diarrhea and emaciation are observed frequently, especially in chronic cases. Emaciated conditions seem to be due largely to difficulty in getting to food and water. We have observed cases that were practically helpless that would eat and drink as long as they could reach the food and water containers. Occasionally an affected bird may seem to be recovering or symptoms may practically disappear, but if such cases are observed for a considerable period, it will usually be found that they will relapse, or that some other type will develop.

The appearance of some other type is likely to occur at any time during the course of the disease. Death, after varying periods of time, is the final outcome in practically all cases. Rarely, if ever, does a complete recovery occur, although respites and arrested progress of the disease are noted sometimes.

The eye type is characterized by depigmentation of the iris, which is frequently followed by constriction of the pupil, impaired vision, and sometimes blindness. Occasionally the pupil may be dilated. As a rule both eyes are involved, or become so, early in the progress of the disease. However, one eye is generally more severely affected than the other, at least in the earlier

stages, but there are outstanding exceptions to this rule. The iris frequently shows, in the beginning, a depigmented circle around the pupil. This circle is generally gray or, at first, may seem to be just a faded condition. This gray circle may extend to such an extent that the normal reddish bay color is almost entirely replaced.

The process may start, however, at any point in the iris, as a small depigmented zone, which may enlarge until varying degrees of depigmentation have occurred, or it may start as a generalized process throughout the iris, characterized by a general faded appearance and depigmentation. Not infrequently the process seems to start in many different areas of the iris at or about the same time. In such cases varying degrees of intermingling of the normal reddish bay and pathologic gray are observed. Sometimes irregular depigmentation and also a streaked appearance are noted. The color changes vary from a faded brown to light or dark gray, bluish or slate. Sometimes a dark brown or black tissue infiltration occurs which resembles a tumorous process and usually is of multiple form.

Opacity of the cornea has been observed. All degrees of involvement have been noted. The course is very variable. The process may spread rapidly or very slowly. Cases are sometimes noted in which the disease seems to have become arrested. When the manifestations are confined to the eye, the affected bird may remain for a long time in apparently good health otherwise, as long as it can see to get food and water. The eye-type cases are very frequently associated with one or more of the other expressions of the disease. Frequently a case that is apparently an uncomplicated eye-type case in the beginning develops some other type after a variable period of time.

While the normal iris of most popular breeds should be reddish bay, there are some that have a different colored iris. The iris of the Cornish, for example, should be yellow or pearl, while that of the Langshan should be dark brown. Some strains of breeds that are supposed to have reddish bay irises produce many birds that have light-colored irises. These factors, as well as a faded condition of the iris that is sometimes observed from other causes, such as general weakness, should be considered in making a differential diagnosis in questionable cases.

The clinical manifestations are very variable in the erythroleucosis and myeloid leucosis types and in cases affected with aleukemic and leukemic lymphoid-like tumors and tumorous-like infiltrations in various organs and tissues. The onset may be gradual or very rapid. General weakness, often accompanied by

diarrhea, is more or less common to these expressions. Marked lameness in both legs is sometimes observed in the myeloid leukemic-like cases in which severe generalized infiltrations are found at autopsy. Lameness has been observed in cases where a tumorous mass was found to be pressing on the corresponding nerve plexus. The skin color of comb, face and wattles may not show any changes, while on the other hand, varying degrees of anemia may be observed, and sometimes an ashy hue or a peculiar pallor is noted.

In the well-developed erythroleucosis cases, anemia is practically always observed, and in these cases the skin of these parts is usually decidedly icteric. The condition of the flesh in such cases often is deceiving and may cause one to think that the bird is in excellent flesh, but upon close examination a somewhat edematous and soft condition may be found. The general tendency in all these expressions is toward emaciation.

The positive blood findings in myeloid leukemia and erythroleucosis cases confirm the diagnosis, but a negative blood finding does not mean that the bird is not affected with some expression of this disease. The examination of a stained blood-smear is all that is necessary to determine the positive or negative condition of the blood from a clinical standpoint. Of course, doubtful blood findings are frequently encountered.

A clinical diagnosis of those cases in which the blood findings are negative is usually impossible. Flock history should be helpful and the findings of an external tumor in the skin or muscle is highly suggestive. In such cases, evidence of some general disturbance is often all that can be detected. A flock diagnosis, however, should not be difficult, in most instances, if a careful examination is made and several suspicious birds are autopsied.

The appetite in birds affected with any of these expressions is usually good, except in the very acute generalized cases and in prostrated birds.

As in the nerve and eye types, all degrees of clinical manifestations have been observed. Some are very mild, some very severe, with all degrees between these extremes.

The course also is variable. Temporary improvement, usually followed by a fatal relapse, is observed occasionally. In some cases the disease makes rapid progress, while in others it seems to progress slowly. Rarely, if ever, does complete recovery occur. Apparently the disease may occasionally become more or less arrested.

The degree of involvement is not always indicated by the clinical symptoms. Sometimes severely affected birds may show

clinical symptoms that would indicate a much milder and less extensive involvement.

AGE, BREED AND SEX

The earliest age at which a typical nerve-type case has been observed by us is 41 days. Many individuals from this same group were affected at comparatively early ages. In general, the most common ages at which the nerve and eye types are initiated is from four to eight months. One case was observed in which the nerve-type manifestations apparently were initiated when the bird was about 20 months of age, but she had been affected with the eye type for a year before the nerve manifestations were noted. Apparently the manifestations in the eye- and nerve-type cases rarely are initiated in birds over 10 or 12 months old. The other expressions also are initiated in birds at the same early age periods. However, some of them, at least, are probably more frequently initiated in birds over 10 or 12 months old than are the nerve and eye types. The nerve- and eye-type manifestations often may be noted in birds over 12 months of age, but probably the disease was initiated in most of these at a much earlier age.

This disease occurs in most of the principal breeds and varieties of chickens. There is some evidence that suggests the possibility that certain strains of chickens may be more susceptible to the disease as a whole or to certain expressions of it, than are other strains. Variations in the causative agent under different conditions possibly may occur. These factors may account, to some extent, for the variable results of different investigations. In our experience sex did not seem to influence the incidence of this disease.

PATHOLOGY

Nerve lesions: The characteristic lesions found in affected nerves are enlargements with lymphoid-like tissue infiltrations. Sometimes the nerves may seem merely to be swollen and somewhat edematous. The glistening white appearance and irregular striations found in normal nerves are usually less distinct in mildly affected ones and frequently completely disappear from those in more advanced stages. The infiltration tissue is tumorous-like, comparatively soft, although well organized, and is dull gray or yellowish gray in color. Affected nerves show much variation in size and degree of involvement. The pathologic manifestations may be very slight or may reach large proportions. The general tendency is toward a diffuse type of infiltra-

tion, although marked variations may be noted in different nerves and in different areas of the same nerve. Nodular formations are sometimes present. Occasionally one of the two long parallel divisions of an ischiatic nerve is markedly involved, while the other is apparently normal or only slightly affected.

The process may be confined to one nerve or to one group of nerves or it may be more or less generalized. The invading tissue seems to replace the normal nerve tissue in affected areas,

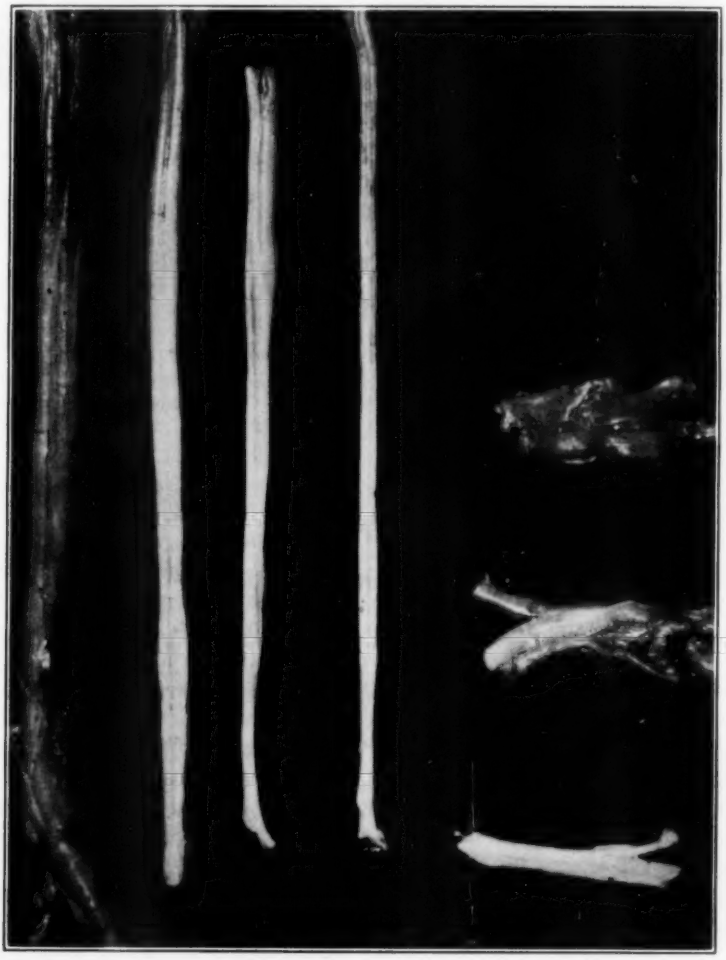

FIG. 1. Leucosis. The four nerves to the left represent one normal and three affected ischiatic nerves. The three nerve plexuses to the right represent one normal and two affected brachial nerve plexuses.

and at times it may practically replace the entire nerve or nerve plexus. In some chronic lesions the primary invading tissue may be more or less replaced by fibrous proliferations. It is probable that these fibrous tissue formations may occur occasionally in lesions in which little, if any, previous lymphoid-like tissue infiltration has occurred. In general the pathologic manifestation resembles that of a malignant neoplastic process, but at times bears a striking resemblance to an inflammatory one. Probably the nerves most frequently affected are the ischiatic, lumbar and brachial plexuses, and the vagus. The nerve roots and ganglion tissue along the spinal column very often are involved. The cervical and mesenteric nerves sometimes are affected; in fact, practically any of the nerves may be involved.

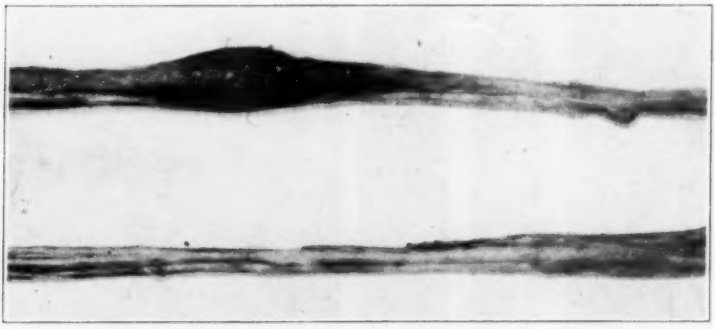

FIG. 2. Leucosis. Two severely affected ischiatic nerves. Both from same bird.

The lesions found in the brain and spinal cord are fundamentally the same as those described in the nerves. However, the lesions in the central nervous system most often are found only upon histopathologic examination, although gross lesions of extensive proportions have been found in the brain and cord. The gross lesions found in the cord are apparently direct extensions from an affected nerve. As a rule, the lesions apparently originate in the peripheral nerves and may or may not extend to the central nervous system. However, there are exceptions to this, as cases are found in which the central nervous system is apparently the primary seat of the lesions and sometimes the only nerve tissue involved, at least to any marked extent.

Histopathologic studies usually reveal an infiltration of rather large undifferentiated, mononuclear, basic-staining, non-granular cells. These cells are considered to be large round-cells, generally speaking, although marked variations in size and shape are observed in varying degrees in most cases. We regard these cells

as the undifferentiated embryonic blood-cell progenitors (blasts). They are apparently the same type cells as those usually called lymphoid cells but it is impossible to determine to just what type they were differentiating. In general, they show the same characteristics and variations as those found in aleukemic and leukemic lymphocytoma, erythroleucosis, large round-cell sarcoma and lymphosarcoma. An occasional eosinophile-type cell is observed.

All degrees of infiltration have been noted, from small-cell nests up to the complete replacement of the entire section. Local or diffuse types have been recognized. Occasionally a marked separation and disorganization of the nerve fibers with edema, and mild cellular infiltration may be the principal features noted.

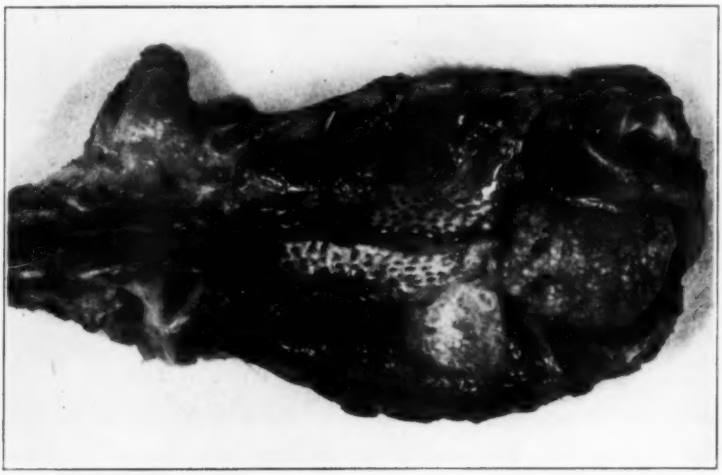

FIG. 3. Leucosis. Severe involvement of left brachial nerve plexus, with infiltration tissue extended into left lung. Ovary was practically replaced by the same pathologic tissue as found in nerve plexus and lung. Anterior portion of kidney also involved.

Intermediate stages between the tumorous-like and the more inflammatory-like types may be observed. In the brain and cord the invading cells frequently are found in irregular nests and around the capillaries as a perivascular type of infiltration.

Mitotic figures are noted in some of the nerve lesions. The statements made concerning the fibrous replacements, and the malignant and inflammatory similarities in the gross lesions, are confirmed by the histopathologic studies.

Eye lesions: The observations on the iris and pupil at autopsy reveal no gross lesions of particular interest that have not already

been described under clinical manifestations. The lesions, however, may be less distinct after death. Therefore, it is very desirable to examine the eyes before death whenever possible. The histopathologic studies reveal the same fundamental findings as occur in the nerve lesions. Eosinophile-type cells seem to be the predominant cell type in some eye cases, while the blast-stage cells described above may be in others. A mixture of the two is sometimes noted. The optic nerve is found to be involved sometimes. The infiltrating cells are apparently the same as those observed in the other nerve lesions already described.

Lesions in other tissues: Leukemic and aleukemic lymphoid-like tumors and tumorous-like infiltrations that are apparently

FIG. 4. Leucosis. Vagus nerve, thyroid gland, heart and proventriculus involved.

the same type as those described in the nerve lesions have been found in practically all of the organs and tissues of the body, notably in the liver, kidney and spleen. They sometimes occur as distinct tumors or as diffuse infiltrations. All degrees of involvement are observed, varying from microscopic foci to those of enormous proportions. The lesions in some cases are confined to one organ or tissue, while in others the process is more or less generalized.

Multiple tumors often are found in some of the organs, especially in the livers of some cases. The pathologic tissue in this type is grossly the same as that found in the nerves. In short, the same general tendencies are noted in these organs and tissues as in those of the nerves. The organs and tissues listed in table

I convey a fair idea of the locations in which this type of tumorous tissue has been found. The color and type of tissue in which the lesions are located generally modify the general appearance of the organ or tissue, although the invading tissue and general tendencies are apparently the same, regardless of their locations.

Histopathologic studies reveal the same type of undifferentiated cells and the same general picture as found in the nerve lesions. Sectioned blood-vessels and capillaries in some cases show an aleukemic blood condition, while in others a leukemic condition is noted varying from a mild to a very severe involvement. The leukemic blood findings include those showing an

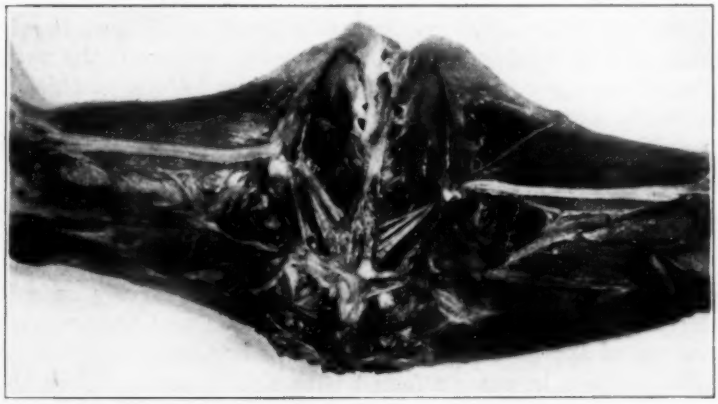

FIG. 5. Leucosis. Left ischiatic and left lumbar nerves severely involved.

erythroleucosis blood condition as well as those in which the white cells are the principal ones involved. These lymphoid-like tumorous lesions are, in general, apparently identical in their gross and microscopic appearances with those manifestations variously described as round-cell sarcoma, lymphosarcoma, leukemic and aleukemic lymphocytoma, and others.

The cut surface of some of the affected organs shows on gross examination that the walls of some of the blood-vessels have been replaced by lymphoid-like tissue infiltrations. Histologic examination of some sections indicates that the walls of some of the capillaries and blood-vessels are apparently made up of the invading cells. The tendency, regardless of the location of the lesion, is for the pathologic cells to invade and replace the involved tissues. In some sections a perivascular arrangement of

the invading cells is noted. Mitotic figures are observed sometimes.

There also are other types, besides the ones described, that are very closely associated with this disease and are included in the positively diagnosed cases. Erythroleucosis is not infrequently noted and is sometimes associated with lymphoid-like nodules, tumors and diffuse infiltrations that seem to be related closely to the erythroleucosis blood picture. There also are some myeloid leucosis cases, including a few outstanding myelocytoma cases, one of the latter being a generalized case, which showed a typical myelocytomatous area in the meninges of the brain. Further discussion is reserved for a future paper.

Bone-marrow and blood: A good many of the cases in which lesions of this disease were found in the bone-marrow showed positive erythroleucosis and leukemic blood conditions, varying in degree from mild to severe involvement. However, the nerve- and eye-type cases, when unaccompanied by lesions of this disease in the bone-marrow, usually showed no significant changes in the blood. Some of the nerve- and eye-type cases, however, which were accompanied by lesions in the bone-marrow, showed positive blood findings. The eye-type cases are much more frequently associated with lesions in the bone-marrow and other hematopoietic organs than are those of the nerve type. The positive blood expressions seem to be dependent largely upon the involvement of the bone-marrow. The blood and bone-marrow, as is true of any other susceptible organs or tissues, may or may not be involved in cases affected with this disease. When they are involved, expressions very similar, if not identical with myelogenous leukemia and erythroleucosis, often occur.

EXPERIMENT A. TRANSMISSION BY INJECTION AND PEN CONTACT

A suspension made from markedly affected tissues of a typical nerve-type case was used as the inoculum for one of the first two groups recorded in table II. The hen from which the affected tissues were obtained showed no gross lesions of the disease except those in some of the nerves, lumbar portion of the spinal cord, and a lymphoid-like tumorous outspread on the ventral surface of the lumbar spine. The tumorous outspread was apparently a direct extension of the same pathologic process that affected the nerve tissues. One of the ischiatic nerves was markedly involved and was used with the pathologic tissues from the spine in making the suspension.

A suspension made from a markedly infiltrated liver and ovary of a hen that did not show any eye or nerve lesions was used

as the inoculum for the other of the first two groups recorded in table II. The pathologic infiltration tissue was of a yellowish gray, lymphoid-like character. Histologically the cells were lymphoid-like, variable in shape and size, and in the undifferentiated blast stage. A close resemblance to an erythroblastic process was noted. The blood picture as observed in fixed and stained tissue was that of either a marked erythroleucosis or leukemic blood condition.

The inoculum for the third group was obtained from infiltrated liver, kidney and ovary of one of the positive cases that developed in the first group and represented the second passage of this strain. The pathologic tissue belonged to the lymphoid-like type. The cells involved were lymphoid-like, undifferentiated blasts. The blood picture was aleukemic.

The birds in groups 1, 2, 3, 4, 5 and 6 were all from the same flock—one in which no case that showed any of the various types of lesions that are considered as expressions of this disease had ever been observed.

The birds in these groups were placed in houses to which elevated, wire-floored sun-porches were attached. They were placed in these houses as soon as they were taken from the incubator. The controls were kept in houses separate from the injected birds. Some birds in each injection group were left uninjected for purely pen contact exposure. The houses and pens were divided into two sections. The birds in the east sections all received the same diet while those in the west received varied diets in the different groups. The general management otherwise was the same in each group. The same attendant cared for all of the experimental transmission groups, which probably accounts for the disease eventually being carried over into the controls.

The positive cases recorded in table II include practically all of the different types previously described, namely, nerve, eye, leukemic and aleukemic lymphoid-like tumors and tumorous-like infiltrations in other organs and tissues, and myeloid and erythroleucosis.

The results as regards the different types produced were fundamentally the same in the group injected with the nerve suspension and in the groups injected with the visceral organ suspensions.

The disease was first positively diagnosed in birds in groups 1 and 2, about two months after they were injected. In group 3 the interval between injections and the first positively diag-

TABLE II—*Results of transmission experiment A.*

Group	Hatched	Birds	Exposure	Injected			Birds Positive							
				Date	How	Amt. (cc)	9-7-31		1-4-32		2-10-32		3-28-32	
							No.	%	No.	%	No.	%	No.	%
1	4-21-31	30	Injected	5-4-31	Intrap.	2.0	6	20.0	15	50.0	20	66.7	22	73.3
		21	Contact	Not injected			0	0	3	14.4	4	19.04	7	33.3
2		26	Injected	5-4-31	Intrap.	2.0	9	34.6	16	61.5	16	61.5	20	76.9
		19	Contact	Not injected			2	10.5	7	36.8	11	57.8	11	57.8
3	6-16-31	40	Injected	7-24-31	Intrap.	2.0			24	60.0	29	72.5		
		13	Contact	Not injected					5	38.4	7	53.8		
4	4-21-31	30	None (Controls)	Not injected			0	0	2	6.7	2	6.7	3	10.0
5	5-22-31	18					0	0	1	5.5	1	5.5		
6	6-16-31	13					0	0	0	0	1	7.6		

nosed case was probably somewhat less. The birds seemed to become affected a few at a time and new cases continued to appear up to at least the last tabulation date in table II.

The mortality rate was extremely high in the injected birds. It was also high in the non-injected birds that were in the same pen with them but much lower than in the injected ones. The mortality rate was very much lower in the controls than it was in either the injected birds or the non-injected birds kept in the same pen with the injected ones.

Besides these groups there were about 30 birds the same age as those in group 3 that were not used in any definite group. These were extras and irregulars that were left over from other groups. No attempt was made to isolate them or to avoid exposure to the disease. About one-third of these became positive. With few exceptions the disease developed more slowly in these than it did in the injected or non-injected birds kept in the same house with them. The positive cases in this irregular group were mostly eye-type cases. There were exceptions to this, however. There were other groups but they did not seem to show anything of importance that has not already been discussed, except that the evidence obtained from them strengthened that secured from the other groups to indicate that the incidence of the disease and its severity were, in general, directly proportional to the degree of exposure and indirectly to the age of the bird when exposed.

The results obtained from Berkefeld filtrate transmission experiments were very irregular, and while there were some positive cases developed after the injections, we do not feel that the evidence presented was sufficient to warrant definite conclusions at this time concerning the transmissibility of the disease by the injection of Berkefeld filtrates.

Transmission experiments A indicate that the disease was transmitted by the intraperitoneal injection of affected tissue suspensions into young chicks and to a less extent by pen contact. The disease also appeared to be carried over to the controls eventually, but, generally speaking, there was a vast difference in the time element and the extent to which they were affected, at least up to about one year after the injections were made. These experiments also indicate that the different types previously described as different expressions of the disease have a common cause.

EXPERIMENT B. TRANSMISSION THROUGH THE EGG

Group 7 represents the progeny of affected females from badly involved flocks mated to an apparently healthy male from a different flock. This mating was made in the spring of 1930. The records show 62 birds in group 7 from this mating. Approximately one year after the birds in group 7 were hatched, the records indicated that 22 (35+ per cent) were positively affected. After approximately two years, the records indicate that 32 (51+ per cent) were positively affected. Cases showing the nerve type, eye type, and tumors or tumorous-like infiltrations in other organs and tissues, and combinations of these various expressions were included among the positive cases.

Group 8 represents the progeny of group 7. Females from group 7 were mated to a male from the same group. Some of the females in this mating were not visibly affected at the time this mating was made, but a considerable number of them were, and some of the others showed some form of the disease later. This mating was made in the spring of 1931. Our records show that 58 birds were in group 8. On January 19, 1932, there were 18 positive cases (31+ per cent). Eye lesions were noted in 17 of them. On April 29, 1932, there were 30 positive cases (51+ per cent). Of these, 28 showed eye lesions. There were no typical nerve-type cases in group 8, although there were 11 that showed nerve lesions in group 7 and only 11 cases that showed eye lesions in that group. There were several outstanding cases of erythroleucosis in group 8. Cases showing infiltrations in various organs and tissues were represented.

Chickens in group 7 were reared apart from affected birds but were allowed to run out on the ground. They were not all of the same age. Chickens in group 8 were observed with those recorded in table II. The chickens in group 8 were not all of the same age, the eggs being incubated whenever they were available. However, the ages correspond reasonably close to the three age groups of the controls. The birds in group 8 were kept in the same type of house, allowed the same kind of run and given the same general management as those recorded in table II. They were kept away from other chickens.

On April 29, 1932, when the last tabulation of the results in group 8 was made, the control records showed that there were 16 positive cases (26 — per cent) diagnosed among the 61 controls in the three combined age groups. For a check between the positive cases in group 8 and in the controls at the time

the first tabulations of positive cases were made in group 8, see table II.

These experiments, as did our field studies, indicate that the disease in its different expressions may be transmitted from parent to offspring through the egg. However, clinical studies suggest that the disease may be transmitted to a small percentage in this way and that the majority may contract the disease from pen contact, following its introduction in this manner. The degree to which the disease may be transmitted in this way may vary very much in different groups. In the selection of affected birds as breeders in transmission experiments of this type, those showing localized manifestations in the nerve and eye are usually the ones most available, but they probably do not transmit the disease easily, and many of this type very likely do not transmit it at all. Birds affected with the eye or nerve types often live and produce hatchable eggs for considerable periods of time. Those cases in which the process is more or less generalized probably cease production in the early stages of the disease, but some may produce during this period, and thereby favor spread of the disease in the flock.

The fact that lesions are sometimes found in the oviduct and testes, and not infrequently in the ovary, suggests that the disease may be transmitted to some of their progeny before reproductory functions are completely checked, and that such birds may be potential transmitters of the disease for some time. Their selection is a matter of chance, because a diagnosis is not possible on clinical grounds when the lesions are confined entirely to the internal organs. In case the blood is involved, a diagnosis, of course, can be made by blood examinations. However, such cases would not be likely to reproduce, and it is impossible to say just what internal organs are involved other than probably the bone-marrow. The above factors probably account, to some extent, for the variations noted in different flocks in regard to the age affected, degree of flock involvement, etc.

There is also the possibility that the factors of resistance and susceptibility to this disease may be hereditary. The evidence indicates that there is a marked difference in the degree of susceptibility and resistance shown by different individuals and by some strains as a whole.

Miscellaneous Etiological Factors

All of our limited attempts to isolate a causative organism from diseased tissues and from eggs from affected flocks at different periods of incubation failed. Neither have we observed

any parasite or other organism in our tissue studies that could be implicated as the cause of this disease.

Our experience indicates that coccidia and other intestinal parasites are not the primary cause of the disease. We have frequently noted coccidia in affected flocks, but this parasite is so common it is apt to be found in any flock. Coccidia, as suggested by Stafseth, may possibly open up avenues of entrance for the causative agent. Possibly they may be incidental carriers, though certainly not essential ones.

Our observations indicate that this disease is not due to any dietetic deficiency. In fact, there is some evidence to indicate that birds in a poorly nourished state, from whatever cause, are somewhat less susceptible than are those that are well nourished.

While we have noted several cases of tuberculosis in flocks that were affected with the disease, and one case in which the bone-marrow was involved which showed a blood picture very similar to that often found in chronic myeloid leukemia, we do not, as has been suggested by some investigators, believe that tuberculosis is in any way associated with the production of this disease. It is possible that the case just referred to was associated with leucosis. The diagnosis of the gross tuberculosis lesions in the bone-marrow was confirmed by microscopic examination of acid-fast stained smears. Tuberculosis lesions were found also in the viscera.

CONTROL

With our present knowledge of this disease, the following suggestions for its control seem warranted:

1. Dispose of all affected birds as soon as noted.
2. Do not use for breeding purposes any bird that shows the least evidence of this disease.
3. Rear chicks on clean ground away from mature fowls.
4. In purchasing new breeding stock, baby chicks, or eggs for hatching purposes, secure them, as far as possible, from a flock in which the disease has never been known to occur.
5. Practice rigid hygiene and sanitation, modifying these to suit local and individual flock conditions.

SUMMARY AND CONCLUSIONS

1. The manifestations found in the eyes, nerves, and central nervous system of cases of so-called range paralysis are expressions of a complex disease process, which is by no means confined to the above locations, but may manifest itself in practically any organ or tissue of the chicken. When the bone-

marrow and other hematopoietic organs are involved, manifestations of myeloid leukemia and erythroleucosis often occur. These two expressions seem to be largely dependent upon the involvement of the bone-marrow.

2. The lesions may be confined to one or more types of tissue in some cases, and to some other type or types in others.

3. The lesions may be localized in one area or more or less generalized. All stages between these extremes may be observed. Almost any conceivable combination, in regard to location of lesions, tissues involved and pathologic types, may be found if a comparatively large number of cases are examined.

4. The disease was transmitted by the injection of suspensions made from the lesions found in birds affected with this disease. It was transmitted also by pen contact. Evidence has been obtained to indicate that it may be transmitted through the egg.

5. The injection of a suspension made from one type apparently produces practically all the types that are considered as expressions of this disease. A different suspension was used in each of three groups of chickens. Practically the same results were obtained in each group.

6. There is some evidence to indicate that the transmissible agent of this disease may be a filtrable virus.

7. No definite etiologic agent has been isolated as the cause of this disease.

8. Coccidia and other intestinal parasites apparently do not cause this disease, although they may possibly open up avenues for the entrance of the causative agent and may act as incidental carriers of it.

9. It is not a deficiency disease.

10. In general, the incubation period seems to be long; according to our studies it was usually about two months or longer.

11. The clinical course is very variable, usually extending over a period of weeks or months, in some cases for a year or more, while in others it is comparatively short. Rarely, if ever, does a complete recovery occur in positively diagnosed cases. Occasionally temporary improvement or arrested progress of the disease may be noted.

12. The disease seems to spread slowly in affected flocks. As a rule only a few birds become affected at a time, but new cases usually continue to occur for a considerable length of time. The losses over a period of six months or a year, after the first evidence of the disease is noted, are often high.

13. The disease is likely to reappear on the same farm from year to year.

14. No preventive or curative therapeutic treatment for this disease in chickens has been found.

15. Practically all of the principal breeds are susceptible, although certain strains may possibly be more susceptible than others. This applies either to the disease as a whole or to some special type.

16. Both sexes seem to be equally susceptible.

17. The frequent, extensive involvement of certain naturally affected flocks should be given due consideration in experimental transmission studies.

18. The bone-marrow and blood should be considered on the same basis as that of any of the other tissues that have been found involved in this disease. That is, they may or may not be involved in positively diagnosed cases of this disease.

19. In general, the pathologic manifestations resemble that of a malignant neoplastic process very much, although their close resemblance to an inflammatory one is very striking at times.

20. The different expressions of this disease apparently show the same general tendencies in regard to clinical course, long incubation period, modes of transmission, different degrees of involvement, difficulties in securing transmissible strains, irregularities in transmission, final results and flock and individual variations.

21. Variabilities in different strains of the causative agent, or different strains of chickens, or both, may possibly be factors causing the variations in result of different workers.

22. This disease is one of the most important diseases of chickens in sections where it is prevalent. Its occurrence seems to be very widespread.

We fully realize that the deductions, enumerated in this paper, are by no means final and are subject to radical changes at any time. We have merely tried to draw as accurate and unbiased conclusions as possible from the results obtained from our studies as we saw them. This disease presents many complex problems, and the combined work of many investigators over a long period of time is necessary to settle the many questions now existing.

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Fighting the Nostrum Menace

Dr. H. E. Moskey, of the federal Food and Drug Administration, is authority for the statement that a vigorous four-year campaign has driven most of the falsely and fraudulently labeled abortion preparations from the market or has forced manufacturers to revise their labels so as to eliminate claims relating to the disease. In recent years the government has found and seized scores of abortion nostrums. Most of these consisted essentially of medicated colored water, colored table salt, table salt with carbolic acid, brown sugar and bran, creosote, or drugs which act as irritants or vascular stimulants. Some of the preparations seized were simple and inexpensive drugs disguised in different ways. Others were mineral mixtures with or without drugs of any kind.

Barking Telephone

A telephone subscriber in Seattle complained to the company that her 'phone never rang, but she knew someone was calling when her dog howled in the back yard. The repair man found the dog chained to the lead-in wires, which caused a short circuit and shocked the dog whenever the number was called.

BLACKLEG AGGRESSIN IMMUNIZATION*

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Roux,[1] in 1888, prepared from guinea pigs a blackleg aggressin which he had passed through a Pasteur-Chamberland filter. Schobl,[2] in 1910, prepared from guinea pigs and later from bovines blackleg aggressin which he centrifuged to remove fat and bacteria. He then added toluol and tested the product for sterility by means of culture and animal experiments. Both Roux and Schobl conducted experiments on guinea pigs and succeeded in immunizing them with 0.5 cc of the aggressins against a fatal infective dose of blackleg culture. The guinea pigs injected with 0.5 cc were protected, while the control guinea pigs died of blackleg.

Schobl stated:

> Even a single injection of aggressin protects guinea pigs against a positive lethal dose of blackleg material. Even though several animals reveal lesions at the site of infection, which points to a local increase of the blackleg bacilli, the animals nevertheless remain alive. This circumstance is explained by the fact that it is difficult to determine the dosage of blackleg material.

Haslam,[3] in 1920, reported the immunization of guinea pigs and bovines with blackleg aggressin. It was deduced that the immunity produced in guinea pigs apparently is proportional to the dose, since 0.5 cc of aggressin protected 20 per cent and 10 cc 81 per cent, while only 5.55 per cent of the controls survived. Five groups of bovines, with from 4 to 6 animals in each group, were injected with 5 cc of aggressin. The time interval between the injections of the aggressin and the infective dose was 14 days. The infective dose consisted of 5 cc of blackleg broth culture. Ten control animals were used in the first group and five in the four remaining groups. Of the 47 calves which were injected with aggressin and later with the infective culture, 7 died. Of the 30 control calves injected with the infective culture, 21 died. In other words, 15 per cent of the protected and 70 per cent of the unprotected control animals died.

Goss and Scott,[4] in 1918, and Scott,[5] in 1923, attempted to determine the potency of aggressin: first, with a washed culture test and, second, by means of a neutralization test. In the first,

*Presented at the sixty-ninth annual meeting of the American Veterinary Medical Association, Atlanta, Ga., August 23-26, 1932.

or washed culture test, one aggressive unit was estimated to be the amount of aggressin which would activate one minimal dose of washed cells to produce typical lesions and death in a guinea pig. In the neutralization test, the aggressive unit was calculated to be the amount of aggressin which would stimulate one infective dose of blackleg culture to kill a guinea pig previously injected with two units of anti-blackleg serum against two infective doses of culture.

Scott,[6] in 1925, offered evidence that the amount of aggressin required to stimulate the minimal amount of washed bacterial cells is the same amount that is required to neutralize one unit of anti-blackleg serum.

Since 1921, we have employed the guinea-pig aggressin test on the basis that a potent aggressin in a sufficient dose will make a sublethal dose infective (table I).

TABLE I—*Guinea-pig aggressin test.*

GUINEA PIG	AGGRESSIN (CC)	BLACKLEG CULTURE* (MGMS.)	RESULT
1	1.0	7.0	L. 5 days
2	1.0	7.0	L. 5 days
3	1.0	7.0	L. 5 days
4	3.0	7.0	D. 48 hours
5	3.0	7.0	D. 48 hours
6	3.0	7.0	D. 72 hours
7	Controls	7.0	L. 5 days
8		7.0	L. 5 days
9		7.0	L. 5 days

*Culture in the form of powdered blackleg-infected muscle, injected simultaneously with the aggressin, 10-23-30.

The guinea-pig aggressin test is a comparatively simple and satisfactory laboratory test, but it offers no basis for the protective value of the product.

Attempts on our part to check the guinea-pig aggressin test with guinea-pig protection tests brought out the difficulties usually experienced with the infective dose. The standardization of the infective dose is therefore of the utmost importance in the blackleg protection test.

Zschokke,[7] in 1927, showed that blackleg aggressins are specific, both immunologically and aggressively, and that sublethal doses of blackleg organisms are not activated by filtrates of either *Clostridium noyvi, Clostridium septicus* or *Clostridium welchii,* but are readily activated by filtrates of blackleg cultures.

STANDARDIZATION OF THE INFECTIVE DOSE

After many attempts to use and standardize a virulent blackleg strain in the form of dried ground infected muscle and cultures in artificial media, we finally made progress by using a 48-hour blackleg culture (stock culture 1912) grown in a liver-brain medium, and transferred into 50-cc bottles. The culture was frozen in a cold vault maintained at 5° F. Upon the removal of a 50-cc bottle from the cold vault, the contained culture was allowed to thaw out slowly at 70° F., whereupon the infective doses were made within several hours.

Tables II and III show tests made on sheep with two 50-cc bottles of stock culture 1912.

TABLE II—*Infective-dose tests on sheep.*

SHEEP*	CULTURE 1912† (CC)	RESULTS (DAYS)						DIAGNOSIS
		1	2	3	4	5	6	
1	0.01	L	L	L	L	L	L	
2	0.01	L	L	L	L	L	L	
3	0.01	L	L	L	L	L	L	
4	0.3	L	D					Blackleg
5	0.3	L	D					Blackleg
6	0.3	L	D					Blackleg

*The weight of the sheep averaged 80 pounds.
†Injected 9-17-31.

TABLE III—*Infective-dose tests on sheep.*

SHEEP*	CULTURE 1912† (CC)	RESULTS (DAYS)						DIAGNOSIS
		1	2	3	4	5	6	
1	0.2	L	D					Blackleg
2	0.2	L	D					Blackleg
3	0.2	L	D					Blackleg
4	0.1	L	D					Blackleg
5	0.1	L	D					Blackleg
6	0.1	L	D					Blackleg
7	0.05	L	D					Blackleg
8	0.05	L	L	L	L	L	L	
9	0.05	L	L	L	L	L	L	

*The weight of the sheep averaged 80 pounds.
†Injected 10-14-31.

The tests included in tables II and III indicate that the infective dose for sheep is between 0.1 and 0.05 cc. A dose of 0.075 cc was subsequently used. (Table IV.)

TABLE IV—*Infective-dose tests on bovines.*

BOVINE	CULTURE 1912* (CC)	RESULTS (DAYS)						DIAGNOSIS
		1	2	3	4	5	6	
1	0.075	L	L	D				Blackleg
2	0.075	L	L	L	L	L	L†	
3	0.075	L	L	L	L	L	L†	
4	0.75	L	L	L	L	L	L†	
5	0.75	L	L	L	L	L	L†	
6	0.75	L	L	L	L	L	D	Pneumonia

*Injected 11-5-31.
†Reinjected on sixth day with 20 cc of stock culture 1912. Died of blackleg within 48 hours.

To determine whether or not the animals that survived the injections were susceptible to the disease, we injected them on the sixth day with 20 cc of stock culture 1912 and all of them died of blackleg within 48 hours.

TABLE V—*Infective-dose tests on bovines.*

BOVINE*	CULTURE 1912† (CC)	RESULTS (DAYS)						DIAGNOSIS
		1	2	3	4	5	6	
1	1.5	L	D					Blackleg
2	1.5	L	L	D				Blackleg
3	1.5	L	L	D				Blackleg
4	3.0	L	L	L	L	L	L‡	
5	3.0	L	D					Blackleg
6	3.0	L	D					Blackleg

*The weight of the bovines used averaged 500 pounds.
†Injected 11-9-31.
‡Reinjected with 20 cc of stock culture 1912 on the sixth day. Animal survived this dose also.

As a result of the tests recorded in tables IV and V, we concluded that it would be best to use 1.5 cc of frozen culture as the infective dose for bovines.

THE PRESERVATION OF BLACKLEG AGGRESSIN

Blackleg aggressin, in the form of edematous fluid and muscle juice in the raw state, decomposes quickly unless it is chilled, clarified, and preserved or sterilized. It is our custom to add 20 per cent glycerin to the raw juice, warm it to 40° C., stir for one hour and then filter through soft paper. Phenol (0.5 per cent), as one of the preservatives accepted by the U. S. Bureau of Animal Industry, was added prior to clarification, candle filtration, and sterilization. The addition of 0.5 per cent phenol,

however, fails to stabilize the physical appearance of the final product, which has the tendency to become turbid and develop a sediment on standing.

The addition of 0.5 per cent formalin in place of the phenol, prior to clarification and candle filtration, in our experience, facilitates both. Formolized aggressin will not become turbid and will not develop a sediment on aging. Aside from the advantages noted in the clarification and candle filtration of formolized aggressin, apparently less substance is removed. This is borne out by the experience with blackleg aggressin 9316 referred to later, which was checked by total solid determination.

Inasmuch as phenolized blackleg aggressin was the product of choice, we conducted a sheep protection test on September 18, 1931 (table VI), and later, on November 5, 1931 (table VII), a bovine protection test on phenolized blackleg aggressin 53870,

TABLE VI—*Aggressin protection test on sheep.*

Sheep	Phenolized Blackleg Aggressin*		Interval	Infective Dose†	Results
	Lot	Dose (cc)			
1	53870	5	33 days	0.075 cc of culture diluted to 1 cc, intramuscularly, 10-21-31	L. 7 days
2		5			D. 39 hours
3		5			D. 34 hours
4		10			D. 28 hours
5		10			L. 7 days
6		10			L. 7 days
7	XYZ	5			L. 7 days
8		5			L. 7 days
9		5			D. 27 hours
10		10			D. 27 hours
11		10			D. 31 hours
12		10			D. 29 hours
25	Controls				L. 7 days
26					L. 7 days
27					D. 33 hours
28					D. 34 hours
29					D. 37 hours
30					L. 7 days
31					D. 28 hours
32					D. 36 hours
33					L. 7 days
34					L. 7 days
35					D. 96 hours
36					D. 35 hours

*0.5 per cent phenol and 20 per cent glycerin. Injected subcutaneously, 9-18-31.

†0.075 cc = infective dose for sheep, established by tests of stock culture 1912 (table III).

prepared on October 23, 1930. This aggressin, on the aggressin unit basis, was estimated to include up to 32 units per 5-cc dose. For comparison we secured some phenolized aggressin XYZ, of supposedly 21 units per 5-cc dose.

TABLE VII—*Aggressin protection test on bovines.*

BOVINE	PHENOLIZED BLACKLEG AGGRESSIN*		INTERVAL	INFECTIVE DOSE†	RESULTS
	LOT	DOSE (CC)			
1	53870	5	32 days	1.5 cc of culture, intramuscularly, 12-8-31	D. 53 hours
2		5			D. 54 hours
3		5			L. 7 days
4		10			L. 7 days
5		10			D. 46 hours
6		10			L. 7 days
7	XYZ	5			D. 31 hours
8		5			D. 29 hours
9		5			D. 39 hours
10		10			D. 40 hours
11		10			D. 41 hours
12		10			D. 42 hours
25	Controls				D. 32 hours
26					D. 42 hours
27					D. 37 hours
28					L. 7 days
29					L. 7 days
30					D. 41 hours
31					D. 24 hours
32					D. 32 hours
33					D. 49 hours
34					L. 7 days

*0.5 per cent phenol and 20 per cent glycerin. Injected subcutaneously, 11-5-31.

†1.5 cc=infective dose for bovines, established by test of stock culture 1912 (table V).

Phenolized aggressin XYZ protected two of three sheep with 5-cc doses, and none of the three sheep injected with 10-cc doses, while seven of the twelve controls died of blackleg. Phenolized aggressin 53870, in 5-cc doses, protected one of three sheep, and two of three sheep injected with 10-cc doses. The infective dose of 0.075 cc killed seven out of twelve, indicating that the dose was a trifle too small to kill 66 per cent or more. The dose used, however, served the purpose in the test, namely, to find the relative protective value of the two aggressins.

The bovine protection test shows the infective dose of 1.5 cc to have been sufficient to kill seven of the ten controls, or better

than 66 per cent. None of the bovines injected with 5- and 10-cc doses of phenolized aggressin XYZ survived. Of the six bovines injected with phenolized aggressin 53870, one of the three 5-cc-dose animals and two of the 10-cc-dose animals survived, equaling a total of 50 per cent.

By November 11, 1931, we had completed the preparation of blackleg aggressin 9316, which consisted of the yield of raw aggressin from *one* bovine. We divided this aggressin into two parts. To one we added 0.5 per cent phenol, and to the other 0.5 per cent formalin. We again noted the difficulty in the clarification and final candle filtration with the phenolized aggressin 9316, and the ready clarification and filtration of the formolized aggressin 9316. Thereupon, we made total solid determinations from samples of each portion and found that the phenolized aggressin 9316 included 7.05 per cent total solids and the formolized aggressin 9316 included 10.0 per cent total solids, a difference of 2.95 per cent. It is of interest also to note that the phenolized aggressin 9316, on the aggressin unit basis, included approximately 18 units per 5-cc dose. On the other hand, the formolized aggressin 9316 included approximately 28 units per

TABLE VIII—*Aggressin protection test on bovines.*

BOVINE	BLACKLEG AGGRESSIN 9316*		INTERVAL	INFECTIVE DOSE†	RESULTS
	PRESERVATIVE	DOSE (CC)			
1	0.5% phenol	5	30 days	1.5 cc of culture, intramuscularly, 2-27-32	D. 32 hours
2	and	5			L. 6 days
3	10% glycerin	5			L. 6 days
4	0.5% formalin	5			L. 6 days
5	and	5			L. 6 days
6	10% glycerin	5			L. 6 days
10	Controls				L. 6 days
11					D. 41 hours
12					D. 33 hours
13					D. 24 hours
14					D. 46 hours
15					D. 33 hours
16					L. 6 days
17					D. 61 hours
18					L. 6 days

*Injected subcutaneously, 1-27-32.

†1.5 cc = infective dose for bovines, established by test of stock culture 1912 (table V, and confirmed in table VII).

5-cc dose. Both aggressins 9316 were placed on a bovine protection test on January 27, 1932 (table VIII).

Again 1.5 cc was used as the infective dose, which killed six out of nine controls (66 per cent). The phenolized blackleg aggressin 9316 protected two of the three bovines, while all three survived injection with the formolized blackleg aggressin 9316.

Discussion

The results of the protection tests are not in agreement with the unit evaluation of the blackleg aggressins tested. It would seem that formolized blackleg aggressin is more stable and potent than phenolized blackleg aggressin. The difference in total solids in the two portions of aggressin 9316 indicates that there may be a relationship between total solids and protection value.

Conclusions

An animal protection test has been worked out for establishing the potency of a test dose of blackleg aggressin.

In the development of the animal protection test it has been shown that a definite dose of a potent product will protect 66 per cent or more of the treated animals, while 66 per cent or more of the controls will die of blackleg.

The animal protection test described will permit of the potency standardization of blackleg aggressin.

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Missouri Special Course

The Missouri Veterinary Medical Association again will cooperate with the Veterinary Department of the University of Missouri in the 1933 special course for graduate veterinarians to be held at Columbia. The course will begin Tuesday, January 23, 1932, at noon, and end on Friday, January 28, at noon, according to information supplied by Dr. J. D. Ray.

VALUE OF SYSTEMIC ALKALINIZATION IN INFLUENZAL TYPES OF DISEASE*

By R. W. HIXSON, *Falls City, Nebr.*

Diseases of the influenzal type have confronted practitioners since the inception of veterinary medicine. They have been observed in all mammalia, including man. Equine influenza was a factor in the armies of the crusaders and in all military campaigns dating from that time. A porcine type of influenza made its appearance at the National Swine Show, held at Des Moines, Iowa, in 1918, and has since spread over the entire Corn Belt region of the United States.

History tells us that shipping fever occurred many years ago in cattle shipped into feed-lots and pastures from the central markets. At that time little effort toward prevention or treatment was made and affected animals were left to die or recover of their own accord. Death losses varied from year to year, with no accurate records of mortality or morbidity. There is evidence, however, to substantiate the belief that death losses in recent years have exceeded those of an earlier day. Current statistics indicate that losses among cattle shipped from markets to farms range from 3 to 20 per cent.

In considering the probable causes of bovine shipping fever, one observes a variance of opinion. That certain bacterial factors, more specifically *Pasteurella bovisepticus*, the diphtheroids, or *B. coli* are pathogenically present in some epizoötics is undisputed. Yet to attribute the specific cause to one or all of these bacteria without due consideration of equally important biochemical factors is not a sound premise. For example, in our series of some 4,500 recorded cases we have not only noted a variety of bacteria, but in all instances a constant disturbance of the acid-alkaline balance toward the acid side. Thus, in milder cases there is exhibited a slight reduction in the blood pH and, in those cases accompanied by coma which are of fatal severity, a profound acidosis. It is only logical, therefore, to presume that this constant, systemically-serious unbalance of the basic body chemistry may be the underlying etiological factor and that the bacterial flora usually isolated are secondary.

The clinical picture of shipping fever shows a wide variety of symptoms. Usually the illness begins with a slight hacking

*Presented at the sixty-ninth annual meeting of the American Veterinary Medical Association, Atlanta, Ga., August 23-26, 1932.

cough which becomes harsh and more painful as the disease progresses. Swollen, watery eyes; hot, dirty muzzles; "tucked-up" flanks, general dulness, variable anorexia and stiffened gait are common symptoms. The respiration is short, painful and of the air-hunger type. Body temperatures vary from subnormal to a maximum of 106° F. Auscultation of the thorax reveals rasping râles. Decumbency and coma precede death in fatal cases. In all affected cattle the urine is highly acid, nasal discharges show an acid reaction to litmus and the blood plasma shows a drop in the normal pH, sometimes as low as 7.1, in contrast to the normal 7.5.

It is the writer's opinion that unfavorable conditions in shipping and handling cattle, such as alternate feeding and fasting, climatic changes, the so-called "filling" in stockyards, weather inclemencies and inadequate shelters are all factors that disturb the normal acid-alkaline balance. There is thus produced a slight acidosis which, in itself, lowers resistance and predisposes to attacks by facultative, bacterial pathogens which are ever present in the body.

Acidosis Present in Influenzal Disorders

When shipping fever is in full swing, with high temperature, tissue dehydration and constipation or diarrhea, the alkaline reserve is further depleted and acidosis more in evidence. Scott, of Kansas State College, states that bacteria isolated from shipping-fever cases grew best in media with a hydrogen-ion concentration of pH 7.2. This fact is important in that this concentration is lower than the pH of normal bovine blood. Many pathologists believe acidosis is constant in all influenzal disorders of both man and animals. This opinion opened a way to treatment well worthy of trial.

On the theory that acidosis is both the cause and effect of bovine shipping fever, we have done much experimental work by treating with alkalies. Since September, 1928, our records show that we have treated in excess of 4,500 cases with alkalies. Bicarbonate of soda was chosen because it is alkaline, available and a normal constituent of the blood and all body fluids with the exception of urine and gastric juice. It neutralizes superfluous acids, replenishes depleted carbonates and permits normal buffer salts to remain in proper relation. Sodium bicarbonate is also a slight diuretic, a mucus solvent and a dependable purgative. By using a solution of this drug intravenously, intraperi-

toneally and orally on the several thousand cases mentioned, we have had definitely good results, bringing the death rate to below one per cent. In the balance of this discussion the sodium bicarbonate solutions mentioned were given intravenously unless otherwise stated.

Temperature is a most important guide symptom in the therapy of shipping fever. In our series of cases we have found that animals, carrying a temperature of 103° F. or higher, may be given sodium bicarbonate without any preliminary treatment and recovery expected—providing the delicate lung tissues have not been irreparably damaged. On the other hand, animals with temperatures below 103° F. are not only suffering from shipping fever but also from impaction of the omasum. Impaction often exists even though the animal exhibits a diarrhea.

Autopsies on some 30 head that carried low temperatures and succumbed to the disease showed an intense omasal impaction. The third stomach content, mostly prairie hay, was a burned, reddish color and of brick-like consistency. The mucous membrane of the omasal laminae was necrosed and peeling from the leaves. The impacted mass was dry, exceedingly hard and emitted a very putrid odor. Bacteriological examinations of this mass revealed mostly *B. coli* developing in a highly acid medium.

Laxatives and Stimulants Recommended

Cases with low temperatures and impaction should be given liberal doses of mineral oil and stimulants before the alkali is administered. The oil is given best by means of the stomach-tube, as this method eliminates risk of mechanical pneumonia. Sodium bicarbonate should be given two or three hours after the oil has been administered. Better results in cases of this type are noted when the alkali is given intravenously rather than intraperitoneally. A favorable prognosis is anticipated unless pulmonary pathology is too extensive.

Our experiments with sodium bicarbonate in shipping fever have included administration by way of the mouth, the vein and the peritoneal cavity. The concentration of solutions so employed has ranged from 1 to 8 per cent and the volume from 250 to 2,000 cc. Experience and data indicate that best results follow intravenous injections of from 1,000 to 2,000 cc of an 8 per cent solution. Weaker solutions do not seem to yield such good results, even though the volume be increased. The two-liter dose of an 8 per cent solution produces more prompt

diuresis and catharsis and it is our opinion that this prompt elimination is essential to successful treatment. Also, the larger doses stimulate by increasing blood-pressure. It has been our experience, too, that these mass doses of sodium bicarbonate solution do no harm. We have not noted a single case of fatal alkalosis in our series of 4,500 so treated.

Recently, we have given 400-pound calves as much as 2,000 cc of an 8 per cent solution intravenously with remarkably good results—in fact, better results than we obtained in the same herd with pint doses. We have observed that the pint dosage often needs to be repeated but in no instance have we had to repeat the four-pint dose. There are a few individuals who will not take a volume of 2,000 cc intravenously. This is due to the venous tension becoming so great that the entire volume of the solution will not flow into the blood-stream by gravity. To these we give the remainder of the dose in the peritoneal cavity. In more severe cases manifesting a diarrhea, and particularly if streaked with blood, we give 8 to 12 ounces of sodium bicarbonate in number 10 gelatin capsules by mouth.

Large Dosage of Soda Indicated

Initially, these large doses of bicarbonate of soda may cause the clinician some concern. However, when we consider that this salt is a normal constituent of the blood (for in the blood and tissues of a normal 400-pound calf there is approximately 12 ounces of sodium bicarbonate) and that this amount is essential for maintenance of the acid-alkaline balance, it will be seen that our dosage is not too large.

McKim Marriet, in his book on "Infant Nutrition," page 322, states:

> The usual dosage of alkali administered in any of the ways mentioned (intravenously or intraperitoneally) is 0.5 gram per kilogram (2.2 pounds) of body weight. This is equivalent to about one-fourth of the normal sodium bicarbonate of the body fluids.

Transposed to ounces and pounds, this is equivalent to about three ounces of sodium bicarbonate to each one hundred pounds of body weight. Two thousand cc of an 8 per cent solution of the drug, therefore, contains only about five and one-eighth ounces of sodium bicarbonate. Hence, in consideration of dosage in relation to body weight, our best results were obtained by approximating from 30 to 50 per cent of the normal body content of sodium bicarbonate in contrast to the 25 per cent advo-

cated by Marriet for acidosis in children. In further support of this dosage I may cite a recent experience:

Ninety-nine head of steers suffering from shipping fever gave a history of being in poor condition upon arrival from the stockyards. The average weight of the lot was 350 pounds. Temperatures throughout the herd ranged from 105 to 106.5° F. We divided off seven groups, with five steers in each group, placing them in individual pens. The remaining 64 were allowed to run together in the feed-lot.

The steers in the first seven groups received different amounts of solutions of sodium bicarbonate of variable strength intravenously, as shown in table I.

TABLE I—*Treatment of seven groups of five steers each.*

	Sodium Bicarbonate Solution	
Group	Strength (%)	Amount (cc)
1	2.5	1000
2	2	1500
3	2	2000
4	5	1000
5	5	1500
6	5	2000
7	8	1500

The remaining 64 head in the feed-lot were given 500 cc each of an 8 per cent solution intraperitoneally.

On the following day three steers in group 1 were not improved and each of these received 1,000 cc of an 8 per cent soda solution intraperitoneally.

The steers in group 2 showed some improvement but were given a repetition of the treatment, namely, 1,500 cc of a 2 per cent solution intravenously.

Groups 3, 4, 5 and 6 were all markedly improved and received no further treatment.

Group 7, which received the largest dosage (1,500 cc of an 8 per cent solution), had completely recovered, showing no evidence of symptoms. Their muzzles were moist, temperatures normal, there was no coughing and their appetites were good.

Among the feed-lot group of 64 head which had received 500 cc of an 8 per cent solution intraperitoneally, 7 had shown no improvement. To these we gave 1,500 cc of an 8 per cent solution intravenously. The balance, numbering 57 head, were given an intravenous injection of 1,000 cc of a 5 per cent solution.

The following day all steers were so markedly improved that no further treatment was deemed necessary.

We observed in this experiment that when soda solutions were given in volumes of 1,500 to 2,000 cc, a noticeably stimulating effect was obtained almost immediately after the injection. The pulse became slower and stronger and the animals showed increased strength and endurance.

Recently we have been giving intravenously a solution of sodium bicarbonate mixed with blood from both convalescent and normal animals. A quart of blood is drawn from the jugular vein of the donor animal and defibrinated by agitation. If no convalescent cases are available, any normal, healthy bovine will do. To this defibrinated blood we add 1 to 3 pints of an 8 per cent solution of sodium bicarbonate. From this combined solution we are getting not only the quick alimentary and urinary elimination characteristic of the soda when used alone, but also a quick, substantial and lasting stimulation. We further found that blood without soda would produce stimulation but the end results were not so satisfactory. This observation is exemplified by the following brief report wherein animals with shipping fever were treated with solutions of blood and sodium bicarbonate. In the groups to be designated as 1, 2 and 3, defibrinated blood from convalescent cases was used. In group 4, blood from healthy, normal animals was used.

Group 1: Four 300-pound steers, with typical shipping fever.

Subgroup A: Two head with temperatures of 104.2° F. and 106.2° F. were each given 1 pint of defibrinated blood intravenously. Both were stimulated but otherwise unimproved within 24 hours. Each was re-treated with one pint of defibrinated blood plus 1 pint of an 8 per cent sodium bicarbonate solution intravenously. Both fully recovered within the next 24 hours.

Subgroup B: Two steers with temperatures of 102.2° F. and 105.6° F. The steer with the low temperature was first given three quarts of raw linseed oil. Two hours later, both steers were given 1 pint of defibrinated blood plus 1 pint of an 8 per cent sodium bicarbonate solution intravenously. Both fully recovered within 24 hours.

Group 2: Eight 450-pound, cross-bred Hereford steers, with temperatures ranging between 105 and 106° F. They were divided and treated as follows:

Subgroup A: Two head received 1 pint of defibrinated blood.

Subgroup B: Two head were given 1 pint of blood plus 1 pint of 8 per cent sodium bicarbonate solution.

Subgroup C: Four were given 1 pint of blood plus 1 quart of 8 per cent soda solution.

Those given blood and soda (subgroups B and C) recovered nicely without further treatment. The two steers given blood without soda (subgroup A) were slightly improved but still off feed after 24 hours. Each was treated with another pint of blood. One of the steers died within eight hours. The other was unimproved and exhibited a bloody diarrhea after 24 hours. This latter steer was given 2,000 cc of an 8 per cent sodium bicarbonate solution intravenously and 8 ounces of dry soda orally. Camphor in oil was employed subcutaneously as a heart stimulant. The steer recovered in 48 hours after the combined sodium bicarbonate and camphor therapy was instituted.

Group 3: Eleven head of 285-pound Angus heifer calves, with temperature levels of 104 to 106° F.

Subgroup A: Four received one quart of blood.

Subgroup B: Four received 2,000 cc of an 8 per cent sodium bicarbonate solution.

Subgroup C: Three received one pint of blood plus 1,000 cc of an 8 per cent soda solution.

In the group receiving the blood alone (subgroup A), one died, two recovered, and two remained unchanged after 24 hours. The two that remained unchanged received a pint each of blood and bicarbonate solution (8 per cent). Both were well within 48 hours. Subgroup B, those that received 2,000 cc of an 8 per cent soda solution alone, were eating and had fully recovered within 24 hours, as did subgroup C, given 1,000 cc of blood and 1,000 cc of an 8 per cent soda solution.

Group 4: Eight head of pure-bred Hereford steers weighing 600 pounds. In the language of the feed-lot, these steers had been "warmed up" before going to the stockyards. They were carrying good flesh and were in fair general condition. Their temperatures varied from 104.2 to 105.4° F. They were treated as follows according to subgroups:

Subgroup A: (Two steers.) Each received one liter of defibrinated blood from healthy Holstein cows.

Subgroup B: (Two steers.) Each received one liter of blood plus one pint of an 8 per cent soda solution.

Subgroup C: (Two steers.) Each was given one pint of blood plus one pint of an 8 per cent soda solution.

Subgroup D: (Two steers.) Each received 2,000 cc of an 8 per cent soda solution alone.

The two steers in subgroup A showed slight stimulation. However, one of these two steers died within twenty hours. The other was treated again with a liter of blood as before. While he did not die, yet he never fully recovered and did not grow or gain during his 90 days in the feed-lot. He ate fairly well and consumed an abundance of water. He was sold subject to postmortem examination and was tanked. No records of packing-plant findings were returned to the owner.

Subgroup B made the most satisfactory recovery in this experiment as they were eating and apparently normal within 20 hours.

Subgroup C comprised the sickest animals in group 4. They were much improved within 20 hours but not fully recovered. They

were re-treated with 1,000 cc of an 8 per cent soda solution and recovery followed promptly within the next 20 hours.

The steers in subgroup D were in good condition one day after treatment but they manifested some blood in their feces. Hence they were given 10 ounces of soda *per os*. By the next morning, the diarrhea had subsided and the two steers were quite normal.

In summarizing our experiment with this series of only 33 sick calves we are mindful that this number may be insufficient from which to draw definite conclusions on the therapeutic value of convalescent or normal blood in the treatment of shipping fever. However, we suggest that such hemotherapy is valuable in that it produces a quick and lasting stimulation. We feel also that the curative properties of defibrinated blood in these cases are greatly enhanced by coincidental addition of the alkaline soda.

As a preventive measure in exposed calves we have administered 500 cc of a 5 per cent solution of sodium bicarbonate intraperitoneally. Thus, of one lot of 400 calves so treated, less than one per cent contracted the disease, even though they had been fully exposed to the trouble.

Almost as good results and a much more practical prophylactic measure under field conditions is obtained by adding bicarbonate of soda to the drinking water in one per cent concentration for four or five days after the animals have been received. It is always advisable to withhold water from feeders for 12 to 24 hours after they arrive at the farm. By so doing they become thirsty and will take a large fill of soda water when it is first offered. This tends to flush the intestinal and urinary tracts. Consumption of the alkalinized water for the next few days builds up the alkaline reserve, thus minimizing the development of the shipping-fever syndrome.

Our experience, covering a four-year period and more than 4,500 cases of shipping fever, indicates that systemic alkalinization is of great value in handling this condition. There is evidently a reduction in the normal pH of bovine blood from 7.5 to as low as 7.1 in this disease. Therefore, the presence of acidosis as a direct factor is obvious. Furthermore, it has been demonstrated that the bacterial flora peculiar to shipping fever develop best in media the pH of which is not over 7.2. Therefore, systemic alkalinization of such cases in cattle is not only theoretically sound, from a standpoint of pathology, but in our hands this therapy has produced good results.

It is important when preparing solutions for intravenous and intraperitoneal use that sterile, distilled water and U. S. P. bicarbonate of soda be used. In several instances severe reac-

tions were produced by carelessness in the preparation of solutions.

Conclusions

Basing treatment of shipping fever on the fact that environmental, nutritional and other factors incidental to shipping cattle produce an unbalance of the acid-alkaline balance, thus permitting facultative pathogens to exalt virulence, the author treated over 4,500 cases with intravenous and intraperitoneal injections of sodium bicarbonate solutions of variable strength. By this treatment losses have been reduced from three to twenty per cent to less than one per cent. Two thousand cubic centimeters of an eight per cent solution of the U. S. P. drug intravenously is most effective. Simultaneous intravenous injection of convalescent or normal bovine blood was helpful, in that it produces quick, lasting stimulation.

Animals manifesting low temperatures suffer from impaction of the omasum and are best treated by oil given by the stomach-tube and with large doses of sodium bicarbonate. A one per cent solution of sodium bicarbonate in the drinking water of newly arrived calves for a five-day period is an effective prophylactic.

Discussion

Dr. A. H. Quin: If no other papers than this were presented at this meeting, I feel that veterinarians in attendance who practice in the cattle-feeding states would be amply repaid for their trip to this beautiful southern city. Dr. Hixson's original research and observations are all the more worth while because they have been carried out patiently, carefully, and persistently, in the environment of a country practice. Much of his work has been done over snow-covered roads, in feed-lots knee-deep in mud, and in the face of all the adversities that we, who live in the severe temperate climate of the North, appreciate.

Veterinarians who have handled cases of shipping fever by Dr. Hixson's method confirm his almost miraculous results. Some failures have been due to errors of diagnosis, too small a dosage or improper concentrations of the drug. One must remember also that many losses among feeder cattle occur from dietary errors, esophagostomiasis, anaplasmosis, coccidiosis, and so forth. It is probable, too, that primary hemorrhagic septicemia, without depletion of the acid-alkaline balance, may occur among feeder cattle just as it sometimes breaks out among well-fed, pampered dairy herds.

A word of warning might not be amiss about handling calves with extensive lung involvement, particularly of the type characterized by extensive edema. Snubbing such cattle with lariat, rough handling, or running them may precipitate their death. It is good judgment to build a suitable chute and handle such cases without undue excitement or struggling. It would be interesting and valuable if Dr. Hixson would tell us something of his methods of handling these wild range calves for intravenous medication.

Biochemistry is as yet a little understood though vastly important phase of medicine. Upsets of the alkaline reserve, the delicately adjusted balance between the acids and alkalies of body fluids, or the altered chemical metabolism of tissue cells is the true key to identifications of many morbid processes. An example of specific therapy based on biochemistry is the specific therapy of calcium in milk fever. In the same light, Dr. Hixson's bicarbonate therapy in the influenzoid diseases is based on just as sound a foundation, for science has proved that in all diseases of the influenzal type there is a disturbance of the acid-alkaline balance to the acid side.

Alkaline therapy is too broad a subject for me to discuss in our limited time. However, there are many diseases in which the administration of alkalies is of direct value. For example, in azoturia there is undoubtedly a distinct acidosis due to generation of sarcolactic acid in the glycogen-rich muscles of affected horses. If the disease is taken in its very early stages, the intravenous administration of one liter of eight per cent baking soda in physiological salt solution is distinctly valuable. This can be fortified by a like amount given intraperitoneally.

Heim, of Germany, has shown that in human tetanus lactic acid formation is constant in connection with muscular rigidity. This, in turn, induces a systemic acidosis. He found, too, that the intravenous use of ten per cent sodium bicarbonate solution produced relaxation of tetanic muscles for from three to five hours, permitting the patient to take food by the mouth. As the trismus was alleviated in the latter course of the disease, sodium bicarbonate orally in heavy doses several times daily shortened the duration of the disease and hastened convalescence.

Probably the most extensive use of alkaline therapy in the Corn Belt is the use of alkalies in the treatment of necrotic enteritis of swine. For this purpose the hydrate rather than the bicarbonate is most useful, although the bicarbonate of soda is a good adjuvant for the hydrate. The hydrate is, of course, converted to hydroxid when placed in solution. Administration for a ten-day period of such alkaline solutions on whole oats without other food results in correction of the ever-present acidosis, cessation of the diarrhea, elimination of excess mucus and intestinal débris, and healing of the ulcers. This alkaline therapy is physiolcgically and therapeutically proper. In human cholera, a very similar disease, Beckman noticed that early intravenous and oral administration of sodium bicarbonate practically obviates death by nephritis and associated uremia.

Other disease conditions characterized by systemic acidosis in which sodium bicarbonate, with or without glucose, is indicated, are extensive burns, fevers, severe surgical operations under inhalation anesthetics, calf scour and calf pneumonia, acetonemia, coccidial dysentery, puerperal sepsis and toxemia, and all septicemias. The field for this type of therapy is almost limitless. Perhaps one of the most indicated uses for sodium bicarbonate is in gastritis of dogs and cats, especially in the gastritis of canine distemper with its obstinate vomition. For this purpose the drug is best used by gastric lavage in a 2 to 5 per cent solution.

Likewise, the drug is indicated as a pre-anthelmintic treatment in poultry and swine. The reason is that the sodium salts, particularly the bicarbonate or hydroxid, clear away the mucus that inhibits the action of anthelmintics and teniacides.

In southern California, Houchin and Blanche have called attention to the almost specific treatment of canine typhus, or Stuttgart disease, by mass subcutaneous injections of physiological salt solution.

A 20-pound dog gets 500 cc twice daily and a 50-pound dog receives from 1,000 to 1,500 cc twice daily. Fifty cc of a 50 per cent glucose solution is added to each 1,000 cc of salt solution. No food or water is given by the mouth and no other treatment is used with the exception of glucose given intraperitoneally. This treatment is continued until marked improvement and cessation of vomiting is noted. Then a fractionally apportioned diet of lean beef is instituted. Under this treatment, California veterinarians report a negligible mortality. I have mentioned this therapy because a sodium salt is used and because typhus is characterized by dehydration and acidosis.

CHAIRMAN BLACKSTOCK: Dr. Hixson has had a co-worker in this work, an M. D. who is a baby specialist—Dr. E. R. Hayes—but I will let Dr. Hixson introduce him.

DR. HIXSON: Dr. Hayes is the man who probably originated this idea, at least among the M. D.'s throughout our section, in treating infants with acidosis. Dr. Hayes is from Falls City, Nebraska. He has given valuable support to me in this work. Dr. Hayes. (Applause)

DR. HAYES: It has been a pleasure to me to be associated with Dr. Hixson in this alkalinization of animals. I originally became interested in this work during the influenza epidemic of war time. At that time I was in the United States Public Health Service, and we observed in the treatment of influenza in man that those who were promptly alkalinized with sodium bicarbonate usually recovered. Very often when it was possible to reach them early, after a thorough alkalinization no other treatment was necessary.

This held my interest for many years, and finally, through the good offices of Dr. Hixson, we started the work among animals.

I think that we should first appreciate that the process of life is one largely of the manufacture of acids. To keep in good health, to keep our system in balance, it is necessary through our food to acquire sufficient alkalies to keep these acids neutralized. The delicate mechanism of the body controlling the acid-alkaline balance permits only a very narrow range, possibly from 7.3 to 7.5, in man, in order to keep him in a healthy state. When we consider that, if the blood of man were to be reduced to the acidity of distilled water or to the alkalinity of tap water, he would die, then you can appreciate the narrow range in which this balance must be maintained.

An interesting thing to me has been that so many times, when we have congestions in the naso-pharynx, the throat, and the lungs, the introduction of an alkali into the blood-stream will, within a short period of time (twenty-four hours), entirely relieve that congestion. Of course, this is somewhere in the chlorid shift. The distention of the cell is relieved, the fluid or the liquor is returned to the blood channels, and the congestion is relieved.

We appreciate the fact that we have not a full answer to influenzal problems at all. Colds and pneumonia in man are still the biggest problems with which we have to deal. Many scientists in this field of work have answered the question by saying that it is a filtrable virus. This is not answering the question. From our bacteriological examinations of the discharges from the nose and throat from animals and man, we can find almost any group of bacteria that you could find anywhere, and also we can find the same group of bacteria present in normal individuals. We believe that the thing that will cause three or four individuals in a room full of people to contract a cold and influenza is based upon a disturbance of this acid-alkaline balance. We believe that it is the answer to the condition called susceptibility, or a predisposition, at which time the bacteria will live and grow if the medium and the environment are proper.

It is a pleasure for me to talk to you gentlemen. I hope at some future meeting that we can give you results of further study on this subject. The further we go in our series of cases the more encouraged we are. We hope you will bear with us and try it out, and maybe you can contribute much to our work along this line. Thank you. (Applause)

CHAIRMAN BLACKSTOCK: Dr. Hayes, we certainly appreciate what you have said and what you have done to help Dr. Hixson in this work. It seems to me that it is something which most of us can use almost every day.

DR. N. S. MAYO: Dr. Hixson mentioned some unfavorable results, apparently due to faulty technic, and I am wondering if this is due to too rapid administration of the solution intravenously. I think that we would be interested in just a word from Dr. Hixson on the technic of administration.

DR. HIXSON: In answering Dr. Mayo I will say that the bad results that we got through administration were due to the fact that I went into a drugstore and asked for sterile distilled water. Immediately after we injected this into the vein of the calf we got a nervous condition and collapse. The calf passed out. We did not notice the first one, but there were four that did that. By the time we got the fifth injected, four of them were gone. I sent some of this water to a laboratory for chemical analysis. The report said, "You do not have sterile distilled water, you have boiled tap water." What was in that I do not know, but that is where we had our bad results—injection of the water that we got from this drugstore which was supposed to be sterile distilled water and apparently was not. What the chemical reaction was I cannot tell you.

DR. MAYO: In administering this solution into the system intravenously, how much time should be taken in injecting it?

DR. HIXSON: It has been my experience that as fast as it will run by gravity through a 14-gauge needle into the vein is not too fast. We have had no bad reactions from rapid injections.

DR. W. A. AXBY: How do you restrain these wild animals?

DR. HIXSON: In our country these animals come from the Panhandle, western Colorado, and the range country, and some of them, in the language of the feed-lot, are pretty "woolly," but they are not bad to handle after you develop the technic.

It is never advisable to lariat any of these calves, particularly if they are wild. Some of these calves that come into the stockyards and are sick are calves that have been raised on the bucket on the farms throughout the Corn Belt. They are not difficult to handle at all. For these wild calves I like to make a chute with several gates. The fewer fellows that you get around to handle them the better off you are. One thing that you must avoid is to keep some fellow, who is inclined to be a little of the cowboy nature, from yelling and hammering around them.

First we make a chute along the side of a barn. We like to have a solid wall. We first set a post in the ground 18 inches from the wall. Then we take a gate, perhaps four feet high—the ordinary slat form of gate—and make rope loops to fit around the front, the middle, and the back, and fasten those to the barn. Then in my equipment I carry one of these small, quarter-inch-rope, wire-fence stretchers, of the block-and-tackle type. We set that with a hook into the barn just a little above the top of the gate.

We will let this represent the gate. We have a small rope leading up to a central point, one from the middle, and one from this end. When we run the calf in, we immediately squeeze him against the

side of the barn. Of course, before that we put a couple of crossbars in. You would be surprised when you get these wild calves in the right position and squeeze them up against the barn to find that they are just as docile as any home-raised calf you ever saw. Then we put a rope halter on and pull the head slightly to one side. Through pressure the left jugular bulges out, and that is the vein we use. If it does not go into the vein through gravity, we have the right side of the calf to inject it intraperitoneally.

There is one thing in connection with intraperitoneal injections that you must watch, that is, particularly, in heifer calves. Sometimes you will have a bunch of heifer calves weighing 300 or 400 pounds apiece; and then you will have some coming from the South, southern Oklahoma, and down through there, that are two years old and are not any larger than the calves that have just come off the cows, and oftentimes you find that one of these older heifers is carrying a gravid uterus. You must be particularly careful, as they are usually thin calves and when you make your injection into the peritoneum you might inject the solution into the uterus. I have done that a time or two.

In making intraperitoneal injections I like to use the ordinary equine trocar. I cut that off to about 3½ inches. That goes through the muscular wall into the peritoneal cavity very readily. It has quite a large tube on it and the solution runs in quickly. There is no time lost at all.

I think that you must be more careful, particularly in regard to the temperature of the solution, when putting it into the peritoneal cavity, rather than into the blood-stream. You have quite a little shivering and shaking after injecting it into the peritoneal cavity but with no bad results.

DR. H. A. HOOPES: Have you ever used the solution in horses with shipping fever?

DR. HIXSON: We have never used it in shipping fever. We do not get many horses shipped in there. We have in our grading camps and construction companies on the highway, every spring and fall, outbreaks of influenza in mules, and we use it intravenously in those cases with very good results, the same as we have in cattle, only that in some instances we have given as high as 3 liters, of an 8 per cent solution, to an animal that weighs 1,500 pounds, with very good results.

DR. HAYES: I think that I might add a word to the question that was asked by Dr. Mayo regarding the preparation of the solution. In the preparation of a solution for intravenous injection it is not necessary to use as much care as it is in the preparation of a solution for injection into the peritoneal cavity. All that is necessary for intravenous injection is to be sure that you use distilled water and dissolve your bicarbonate of soda in the distilled water. Intraperitoneally it is sometimes necessary to boil the solution. If you boil sodium bicarbonate solution, you eliminate your CO_2 and you have a carbonated sodium solution; so it is necessary to pass CO_2 through your solution in order to get back your bicarbonate solution.

In our ordinary preparation of these solutions we simply take distilled water at a warm temperature, about 95 degrees, and dissolve the bicarbonate of soda, and we have had no reactions except when we got the foreign protein reactions from the undistilled water.

COL. B. A. SEELEY: What is your opinion on the value of this in the treatment of azoturia and laminitis?

DR. HIXSON: I have never used it in laminitis, but I have used it, as I recall, in about three cases of azoturia with very good results.

You get a very quick elimination from both the bowels and the kidney, and I think it is best in those cases if we not only give it intravenously but pass the stomach-tube, and pump in a large amount of water. To that I add a pound of sodium bicarbonate, and I have had outstanding results. I did that at the suggestion of Dr. Quin a year ago, and in those three cases I have had wonderful results.

COL. SEELEY: The reason I asked that question is that there may be some connection between the results obtained in the treatment of these two diseases with potassium iodid, and I intend to try this out on azoturia and laminitis to see whether it will give better results than potassium iodid.

Reducing Foot-and-Mouth Disease Hazard

With a view to lessening the risk of foot-and-mouth disease in England, the Ministry of Agriculture issued an order providing that persons having any meat, bones, offal, swill, etc., shall boil them before feeding them to animals. Only those manufacturers of proprietary foodstuffs who hold certificates are exempted from the order. In addition, a special order regarding meat importation has been re-issued. This provides that imported meat shall be wrapped in cloths of a prescribed pattern, so as to prevent such wrappings being used again on articles which may go to farms. Feedstuffs, fertilizers, etc., may not be landed in bags or sacks made from meat wrappers and may not be sold in such wrappers.

Equine Parasite Control in Illinois

A series of nine meetings of veterinarians, in as many different parts of Illinois, has been scheduled for the purpose of putting on a systematic campaign for the control of equine parasites. About forty veterinarians met at Centralia, on November 15; about one hundred, from six counties, attended the meeting in Decatur, on November 17, and another hundred were present at the meeting in Peoria, the following day.

Dr. Robert Graham, of the University of Illinois, reports that about 150,000 horses, belonging to 20,000 owners, in 66 counties of Illinois, have already been treated, with generally satisfactory results. Dr. E. M. Nighbert, of the U. S. Department of Agriculture, is temporarily stationed in Illinois to assist with the educational program.

Hog prices at Chicago, as of November 29, dropped to $3.30, back to the 1932 low, equalling the lowest top since December, 1878.

Ed Wynn gives the recipe for the best way to make a milk shake—stable a cow in a haunted house.

THE PREOPERATIVE AND POSTOPERATIVE CARE OF SMALL ANIMALS*

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The outcome of a surgical operation is usually dependent on three factors: the preoperative preparation of the patient, the anesthesia and perfection of operative technic, and the postoperative care. Only the first and last of these factors, which are especially pertinent to small animals, will be considered in this paper. The preoperative and postoperative treatment vary somewhat for different species of animals. Since the dog is most frequently operated on, this species will be considered first. Surgeons working on human beings have learned that there are two important measures to be observed preoperatively, namely, to withdraw food 16 to 24 hours before operation, and to maintain the body fluids. These rules are never violated except in case of emergency operation. Surgeons operating on small animals should likewise adhere to these rules.

In the preparation for operative procedures on the gastrointestinal tract, the withdrawal of food for 16 to 24 hours before operation serves two purposes: (1) It reduces the size of the abdominal organs, thus making surgical procedures easier, and (2) the dog would otherwise vomit during or following operation, regardless of the kind of anesthetic used. If gastric contents are present, they will often be aspirated with resulting fatal pneumonia. In my experience, pneumonia occurs only in association with distemper or following inspiration of gastric contents. The simple withdrawal of food, therefore, is more desirable than washing the stomach. When the operation involves the upper part of the intestinal tract, the rectum may be emptied by an enema. However, an enema is not given if the operation is on the colon, as it often causes so much edema of the colonic mucosa that healing is retarded and infection may occur.

Water is never withheld from the dog at any time in relation to the operation. On the other hand, it is frequently administered by stomach-tube three to six hours before operation or intravenously shortly preceding anesthesia.

After considerable experience and observation, I concluded that the preoperative use of drugs, such as morphin or atropin, is

*Presented at the sixty-ninth annual meeting of the American Veterinary Medical Association, Atlanta, Ga., August 23-26, 1932.

not desirable when ether anesthesia is used. However, if local anesthesia is to be used, or some of the numerous drugs for producing analgesia, preliminary medication may be desirable.

The important essentials of postoperative care are to assist the animal to maintain its normal body temperature, to maintain the body fluids, and to administer an adequate maintenance diet as soon as possible.

A dog should never be permitted to become chilled subsequent to an operation. If the kennel room is not warm enough, heat should be applied by hot-water bags, electric pads, or an electric stove of the reflector type.

It is most important to maintain adequate fluid volume following operation. If considerable hemorrhage has occurred during operation, it sometimes is desirable to give a transfusion directly with whole blood from another dog. The amount and character of the fluid and the method of administration depend somewhat on the type of operation which has been performed. Following many operative procedures, it is necessary only to have water before the animal at all times in order to maintain the proper fluid volume. If the operation has been severe, it is essential to administer fluid intravenously, often in the form of hypertonic salt solution and glucose. If the operative procedures have involved any portion of the gastro-intestinal tract or the liver, it is a desirable and often a life-saving measure to administer 15 cc for each kilogram of body weight of 10 per cent glucose in a 0.9 per cent salt solution intravenously. This is always done if the operation has been on the upper portion of the intestinal tract. If the operation has been on the liver, and jaundice is present, or on the esophagus, it may be desirable to withhold food for several days. In such cases glucose is administered intravenously twice daily.

A very simple method of transfusion is used for dogs. The necks of both the donor and recipient are shaved. Six 50-cc clean glass syringes equipped with either 16- or 18-gauge needles are at hand. The external jugular vein is punctured, and a syringe quickly filled with blood from the donor. The blood is injected immediately into the external jugular or femoral vein of the recipient. This is repeated, using a new, clean syringe each time, until sufficient blood has been transfused. The amount will vary from 200 to 600 cc, depending on the size of the recipient and the amount of hemorrhage at operation. Anticoagulants are not necessary with this method, as each syringe is used only once, and then it is cleaned and dried.

The blood of one dog is rarely incompatible with the blood

of another. Since it has been impossible to group dogs in the same manner as human beings, no special care need be exercised in selecting a donor except that a large animal is preferable in order that an adequate amount of blood may be obtained without endangering his life.

Glucose solutions are prepared by placing 10 gm. of pure dextrose in a flask and then adding physiologic sodium chlorid solution to make 100 cc. If a sterile solution is desired, the solution is heated to the boiling-point on a hot plate or water-bath and then cooled to body temperature.

The diet of dogs is important, following certain types of operation. In general it is desirable, and in some instances, such as after operation on the gastro-intestinal and biliary tracts and in cases of injury to the liver and jaundice, it is essential to maintain the animal on milk and syrup for a week or two after the cessation of intravenous treatment.

The preoperative preparation of the cat is the same as that of the dog, and its postoperative care is somewhat the same. However, I do not attempt transfusion on cats, and it is rarely indicated, as operations on cats are not attended with the same degree of hemorrhage as those on the dog. The most important points to observe for cats are to give them ample water by mouth and maintain their body temperature during and immediately after operation.

It is impossible to empty the gastro-intestinal tract of rabbits by fasting. Nevertheless, it is desirable to fast them for a day or two before operation. It is most important to maintain their normal body temperature during, and subsequent to, operation. The temperature-regulating mechanism of rodents is easily upset by general anesthetics. For that reason incubation for the first few hours following operation is often life-saving.

The sheep and goat are the only species of animals that are given preoperative medication, such as morphin and atropin. The flow of saliva is so great, if they are anesthetized with ether, that unless great care is exercised in drawing the saliva away, or in preventing its secretion, the animal may drown.

Because of the peculiar gastric development in the sheep and goat, we have found it desirable to withhold water as well as food before operation. When the animal is in the lateral or dorsal recumbent position and the abdomen is opened, the fluid contents of the rumen and reticulum will readily flow out through the esophagus. Aspiration may occur, with resulting pneumonia.

DISCUSSION

DR. S. W. HAIGLER: Do you advise drinking water before and after operation?

DR. SCHLOTTHAUER: We always do.

DR. HAIGLER: Have you experienced any trouble with dogs vomiting under such conditions?

DR. SCHLOTTHAUER: We apparently have not had any difficulty.

DR. HAIGLER: It has been my experience that dogs frequently will vomit if they drink water.

DR. SCHLOTTHAUER: I believe that, if you have withheld food long enough, the solution vomited would be quite harmless. And too, if a dog has had sufficient fluid before operation he rarely drinks enough to cause serious vomiting.

DR. HAIGLER: If given water shortly after a major operation, dogs will frequently vomit it, and where they vomit four or five times it leads to bad results, in my opinion and experience.

DR. SCHLOTTHAUER: A lot of work is done in an experimental way upon various animals—anything they might hope to do on the human being for life-saving purposes. Animals certainly have all kinds of operations on the intestinal tract. We do not find any harm from giving them water.

DR. H. J. MILKS: I wonder if the difference between Dr. Haigler's results and Dr. Schlotthauer's is not due to the fact that very many of the cases that the veterinarian gets for operation are in an alarming stage and are going to pass out anyway. In most of the cases we get, in which we have foreign bodies to remove from the intestinal tract, we do not have a very good patient to start with.

I am wondering what the objection is to preanesthetizing, for example, giving a small dose of morphin. I also want to ask Dr. Schlotthauer if he has any trouble with the blood clotting when entering the needle. We get in the vein and draw out some blood, and it clots in spite of everything.

DR. SCHLOTTHAUER: I have never observed any trouble. However, I do not give the transfusions. Our technicians do that. They do many of them every week. We never have any trouble with clotting, providing our needles and syringes are dry when we start. The needle should be washed and dried before it is inserted.

DR. MILKS: How do you sterilize the needle?

DR. SCHLOTTHAUER: We do not sterilize the needle. We merely wash it in tap water and dry it with a towel.

DR. MILKS: Do you ever lay it down and wait for it to dry?

DR. SCHLOTTHAUER: We just dry the syringe as much as we can with a towel, inside and outside. We do not make any attempt to sterilize the syringe. That would be good practice, however.

MEMBER: A physician who graduated in New York and quit specializing in surgery, has been doing experimental work with surgical instruments. He also works in the experimental laboratory of Bellevue Hospital. He has had some difficulty with the blood coagulating when it was taken out; and time being a considerable factor in the changing of the syringe, some time ago he patented a syringe which is to be put on the market, which is a single-barrel syringe. It has a tube on one end and a needle on the other, the tube is placed into the vein and the needle into the recipient, and the blood is taken out and changed with one plunger stroke. It is quite a splendid invention. I think it will be a great boon to the transfusion operation.

DR. D. K. EASTMAN: I think there are two ways of avoiding that. The ordinary 40-cc syringe, which is very commonly used by vet-

erinarians, does very well. It fills and injects beautifully and works very nicely.

DR. J. E. CRAWFORD: In Dr. Schlotthauer's paper I understood him to make the statement that pneumonia in the dog is practically an unknown disease, except when associated with distemper, or inhalation or mechanical pneumonia.

DR. SCHLOTTHAUER: That is, just in regard to operative procedure.

DR. CRAWFORD: I find in my experience that primary pneumonia in the dog is rather a rare disease. I do not recall many cases of pneumonia in my practice. Usually it has been associated with some other disease. Pleurisy, we know, exists in the dog in a great number of cases. Pneumonia, as a primary disease, is very rare in the dog, except when associated with distemper or mechanical pneumonia.

DR. SCHLOTTHAUER: I think that many times when we get pneumonia following an operation, if the owner would give us a complete history, we would find the dog had had an attack of some respiratory trouble some weeks before. Lung lesions will persist in many dogs for several weeks. They may be just small lesions but an anesthesia will stir them up very rapidly. It is the same in a case in which a human patient dies with pneumonia a day or two after being operated on. It means he had pneumonia for some time, and it took the anesthesia to stir it up.

DR. H. SCHRECK: In my part of the country we have lots of pneumonia, and I find much of it coming from people who run a hose on the dog thinking they are doing a nice thing to cool him off. The animal is chilled right away and gets pneumonia. I get about 300 cases a year; so I think pneumonia cases down there are always considered fatal.

DR. SCHLOTTHAUER: We use large needles, never smaller than a 19 gauge and generally a 16. That permits rapid drawing of blood. The vein is quite large. Even on a rabbit, in the ear vein, we generally use a 19 gauge needle. You do not have to use such a large needle, but it will go into the vein.

DR. H. C. REA: In establishing or increasing the body fluids, does the addition of ten per cent glucose have any advantage over the sodium chlorid solution?

DR. SCHLOTTHAUER: In cases of high intestinal operation the sodium chlorid is beneficial. I seem to get even better results when glucose is added. We can withhold food a little longer on those cases. This intravenous medication seems to prevent jaundice.

DR. J. R. WELLS: Do you ever inject a solution that is not sterile?

DR. SCHLOTTHAUER: Absolutely. The blood-stream is the most resistant organ we have in the body. However, I would say that in practice it is always advisable to inject sterile solutions. Always sterilize the solution if you have the time. In case of emergency you may not have time. You very rarely find many organisms in ordinary tap water which is fit to drink. If you do find organisms there, they usually are non-pathogenic.

To show you that tap water is comparatively safe, it is the practice in many large hospitals throughout the country for the surgeon to wash his soiled gloves in running tap water and then continue with the operation. The water is not sterilized, but of course it is checked frequently for bacteria.

The lamb, the bull-frog and the pole-cat went to the circus. Admission was a dollar, but they didn't all have the price. The lamb had four quarters, and the frog had a greenback, but the pole-cat had only a scent.

AN INTRADERMAL TEST FOR DETECTING JOHNE'S DISEASE OF CATTLE*

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To prevent the spread of Johne's disease (paratuberculosis) within a herd and from one herd to another, it is necessary to have an accurate method of detecting the diseased animal. The symptoms of this disease are an intermittent and persistent diarrhea, associated with a marked emaciation. Cattle may be infected for many months without showing clinical symptoms. Infected animals discharge the causative organism in their feces and by this means contaminate feed and water which are ingested by other cattle. The organisms are probably excreted by infected animals before symptoms are evident. Johne's disease cannot be diagnosed clinically in its early stages, which fact has been the stimulus to search for a diagnostic agent that would detect animals before symptoms are manifested.

The diagnostic agent first used for detecting Johne's disease in cattle was avian tuberculin. Some animals showing clinical evidence of the disease gave marked reactions following the injection of this tuberculin. Since the successful cultivation of Johne's organism (*Mycobacterium paratuberculosis*) by Twort and Ingram,[1] most investigators have used diagnostic products prepared from this organism.

The product prepared from the organism usually is called "johnin" and it has been injected subcutaneously and intravenously for the purpose of producing a thermic reaction in infected animals. In general the subcutaneous injection of johnin has not been so satisfactory as when this product was injected into the vein. During the past few years the intravenous johnin test has been employed more extensively than any other in the diagnosis of Johne's disease.

INTRADERMAL USE OF JOHNIN

In 1916, M'Fadyean, Sheather and Edwards[2] reported that it was possible to extract from the bodies of artificially cultivated

*Received for publication, April 20, 1932.

Johne's bacilli a substance which is capable of producing positive results in the diagnosis of this disease when injected intracutaneously. The johnin was injected into the skin of the caudal fold of six calves that had been infected by an intravenous inoculation of the organism, and distinct reactions were observed in five of the animals. A swelling of the skin to at least twice the normal thickness was considered positive.

Vallée and Rinjard,[3] in 1926, obtained satisfactory intradermal reactions with johnin in animals artificially sensitized by subcutaneous inoculation of Johne's organism. The same johnin did not produce so evident a reaction in thirty cattle naturally infected with the disease. The authors were of the opinion that the failure to obtain pronounced reactions in the naturally infected cases was due to testing cattle in the advanced stages of the disease. Swellings which did not persist beyond the 24th hour following injection were considered non-specific.

Dunkin,[4] in 1928, published the results obtained with a double intradermal johnin test, made on 298 cattle. A concentrated johnin was injected into the deeper structures of the derma. He found that the double intradermal johnin test did not produce a reaction in a normal animal or in one suffering from tuberculosis. His experience with the test revealed that a positive reaction is obtained in nearly all animals affected with the disease, the exception being some very advanced cases, and he was of the opinion that the test appeared to be a reliable diagnostic agent for Johne's disease.

In 1930, Lash and Mohler[5] stated that intradermal inoculations of concentrated johnin into the caudal fold of cattle have frequently produced large swellings in animals that had previously given positive reactions to the intravenous tests.

The intravenous johnin test, now generally used in this country, is a laborious method, especially when a considerable number of animals are to be tested. The intradermal use of johnin, if reliable, would overcome the objections to the intravenous test. The data in this paper represent the results of an effort to determine the value of the intradermal johnin test for detecting Johne's disease of cattle.

Preparation of Intradermal Johnin

The johnin for intradermal use was prepared by growing a pure culture of the Johne's organism on a synthetic liquid medium to which had been added a moist killed growth of *Mycobacterium phlei.*

The culture medium was prepared according to the formula published by Hastings, Beach and Mansfield,[6] its composition being as follows:

	Per cent
K_2HPO_4	0.1
Sodium citrate	0.05
$MgSO_4 \cdot 7H_2O$	0.1
Asparagin	0.5
Glycerin	7.0
Ferric citrate	0.006
Moist growth of *M. phlei*	0.5-1.0

Cultures of *Myco. phlei* were grown on plain nutrient bouillon for about a week, killed by autoclaving, and collected by filtration through paper. About one gram of this moist, dead growth was added to 100 cc of the synthetic liquid medium, the reaction of which was about pH6.8 and required no adjustment. One hundred cubic centimeters of this medium was placed in a 300-cc Erlenmeyer flask and sterilized by steam on three successive days. Several strains of Johne's organism were cultivated on this medium. A culture obtained from the University of Wisconsin grew luxuriantly on the surface of the medium and was used for the preparation of the intradermal johnin. The growth of this culture was heavy and wrinkled, and reached its maximum growth in three or four months. The culture could be cultivated only on media containing the cells or extracts of acid-fast bacteria. Cultures a year old did not show pigmentation.

Cultures for the production of johnin were incubated for six months to a year at 37 to 38°C. The flasks containing a luxuriant growth were thoroughly shaken and the resulting suspension evaporated to one-tenth of its original volume on a water-bath. The concentrated material was then filtered through paper and the filtrate placed in amber bottles of 2-cc and 4-cc capacity. The bottles containing the johnin were submerged in a water-bath and heated on three consecutive days for one hour at 60 to 65°C. The johnin then was stored in a refrigerator at about 5°C. After it had stood for a few weeks, a slight precipitate could be observed on the bottom of the bottles. This flocculent material was removed by filtration. The johnin prepared in this manner was a sterile, clear, amber-colored fluid resembling tuberculin. Intradermal injections of large amounts of this johnin did not cause reactions in cattle free of Johne's disease.

Technic of Intradermal Injection

The side of the neck was used as the site of injection. A small area was shaved and swabbed with alcohol. A fold of

the skin was measured with calipers and 0.2 cc of the johnin injected into the deeper structures of the derma at that point. The injection was made with a 2-cc syringe, using a 26-gauge needle. Measurements were taken at 48-hour and 72-hour periods following the injection.

Interpretation of Dermal Reactions

Cattle showing an increase in dermal thickness of double, or more, the original measurement, at the 72nd hour, were classed as positive reactors. Those showing an increase less than double but more than one-half the normal thickness of the skin were considered suspicious.

Many animals showed no swelling or tenderness 72 hours following the injection, while others had a dermal thickness of two to four times the normal. In the latter cases the swellings were usually definitely circumscribed, somewhat edematous, and painful to the animal on palpation.

Table I shows the reactions commonly observed following the intradermal injection of johnin. The six bulls indicated in this table were from a herd known to be infected with Johne's disease.

Table I—*Skin reactions observed following injection of johnin.*

Animal	Skin Measurements (in mm.)			Classification
	Normal	After First Injection		
		48 Hours	72 Hours	
1	6	7	7	Negative
2	6	8	8	Negative
3	6	7	7	Negative
4	5	8	8	Suspicious
5	13	13	13	Negative
6	13	28	28	Reactor

Bull 6 was slaughtered and smear preparations, made from the affected parts of the intestinal mucous membrane and mesenteric lymph-glands, revealed clumps of acid-fast organisms.

Intradermal Johnin Tests

A total of 312 cattle was tested with the intradermal johnin in twenty known-infected herds located in thirteen counties of Ohio. The work is summarized as follows:

Total number of cattle tested	312	
Positive reactions	41	(13.1%)
Suspicious reactions	32	(10.2%)
Negative	239	(76.6%)

TABLE II—*Skin and temperature reactions following injection of johnin in a herd of 20 cattle.*

Animal	Sex	Age (yrs.)	Skin Measurements (mm.)			Classification	Pre-Injection Temperatures (hours)			Johnin (cc)	Post-Injection Temperatures (hours)									Rise Following Injection	Classification
			Normal	After First Injection			4	2	1		1	2	3	4	5	6	7	8	9		
				48 hrs.	72 hrs.																
1	F	7	5	6	6	N	1.4	1.6	1.8	6	1.4	2.0	1.6	1.2	1.8	1.6	1.6	1.8	1.4	0.2	N
2	F	6	7	8	8	N	1.6	1.2	1.6	6	1.6	2.0	1.8	1.8	2.0	1.8	2.0	2.0	2.0	0.4	N
3	F	7	6	7	7	N	2.0	1.4	1.6	6	1.6	1.6	1.0	1.4	1.6	1.0	1.6	1.8	1.6	0.0	N
4	F	3	7	9	9	N	1.6	1.6	1.6	6	1.8	1.8	1.2	1.4	1.4	1.6	2.0	1.4	1.6	0.4	N
5	F	5	7	8	8	N	1.6	1.2	1.4	6	1.6	1.6	1.4	1.0	0.8	1.6	1.0	1.6	1.2	0.0	N
6	F	6	7	10	8	N	1.6	1.2	1.6	6	1.2	1.6	1.2	1.2	1.6	1.6	1.4	1.8	1.8	0.2	N
7	F	6	7	7	7	N	1.6	1.8	1.8	6	1.4	1.2	1.8	1.4	1.2	1.6	1.6	1.6	1.4	0.0	N
8	F	6	7	8	8	N	1.8	1.6	1.6	6	1.8	2.0	1.8	1.6	2.0	1.8	1.6	1.8	1.8	0.2	N
9	F	3	6	8	7	N	1.8	1.4	1.6	6	1.6	1.6	1.6	1.6	1.6	1.4	2.0	1.6	1.4	0.2	N
10	F	6	6	7	7	N	1.8	1.6	1.8	6	1.6	1.8	2.0	1.6	2.0	1.6	2.0	1.8	1.8	0.2	N
11	F	5	6	8	8	N	1.6	1.2	1.4	6	1.4	1.4	1.0	1.0	1.2	1.6	1.2	1.0	1.4	0.0	N
12	F	2	7	18	18	R*	1.0	1.2	1.6	10	1.6	1.4	1.2	1.2	1.8	1.2	2.8	3.2	4.6	3.0	R*
13	F	5	8	8	8	N	1.8	1.4	1.4	6	1.8	1.6	1.4	1.2	1.4	0.8	1.4	1.6	1.2	0.0	N
14	F	5	6	8	8	N	0.8	1.2	1.2	6	0.8	1.6	1.4	0.8	1.2	1.6	1.0	1.4	1.6	0.4	N
15	F	3	7	8	8	N	2.0	1.6	1.8	6	1.6	2.4	2.0	1.6	1.6	1.6	2.6	2.0	2.0	0.6	N
16	F	7	6	12	12	R†	1.6	1.6	2.0	20	2.0	2.4	2.4	1.6	2.2	2.0	2.2	2.0	2.2	0.4	N†
17	F	3	8	10	10	N	1.8	1.4	1.6	6	1.6	1.6	2.0	2.2	2.2	2.0	2.4	2.0	2.2	0.6	N
18	F	2	7	14	14	R‡	2.0	2.0	2.0	10	1.8	2.0	2.4	2.0	1.8	2.4	2.6	1.6	2.0	0.6	N‡
19	F	2	10	10	11	N	1.2	1.0	1.4	6	1.6	1.8	1.6	1.6	1.2	1.4	1.6	1.4	1.4	0.4	N
20	M	4	11	13	13	N	1.2	1.0	1.0	10	1.0	1.4	1.0	1.0	0.8	1.0	1.0	1.4	1.6	0.4	N

R = reactor; N = negative.

*Slight lesions of Johne's disease at autopsy. Microscopic examination of intestines and lymph-glands for Johne's organism negative.

†Marked lesions of Johne's disease at autopsy. Microscopic examination of intestines and lymph-glands for Johne's organism negative.

‡Slight lesions of Johne's disease at autopsy. Microscopic examination of intestines and lymph-glands for Johne's organism positive.

Of the 41 cattle giving positive reactions to the intradermal test, 12 were clinical cases, and of the 32 giving suspicious reactions, six showed symptoms of Johne's disease.

The johnin used for the intravenous tests here reported was purchased from a commercial laboratory. This johnin had been prepared by growing the Johne organism on Long's synthetic medium, to which killed *Myco. phlei* had been added, and contained the products of growth elaborated by the Johne organism and the substance extracted from the cells. The organisms were removed by filtration. No heat was used in the process of preparation. Doses of 5 cc of the johnin were recommended for normal mature cattle.

Interpretation of Temperature Reactions Following the Intravenous Injection of Johnin

Most of the cattle tested by the intravenous method were injected with 5 or 6 cc of johnin. Animals showing clinical symptoms of Johne's disease and reactors to the intradermal test were given from 10 to 20 cc of johnin.

Cattle with post-injection temperature rises of 1.5°F. or more above the highest pre-injection temperature were designated reactors, as suggested by Lash and Mohler.[5] Animals with a slight post-injection temperature rise were classed as suspicious. O. Bang,[6] in 1914, thought that a rise in temperature to 103.6°F. could be considered positive, if the preliminary temperature did not exceed 102.2°F. In 1928, Wright[7] regarded a rise of 2°F. or more from the highest pre-injection temperature as a positive reaction indicative of infection, and a rise of 1.5, but less than 2° F. was considered as suspicious.

Comparative Intradermal and Intravenous Johnin Tests

In every instance the intradermal johnin test preceded the intravenous test, and usually both tests were completed within a week.

The results obtained with the two tests in a herd consisting of twenty cattle are shown in table II. A five-year-old cow had died in this herd, showing symptoms of Johne's disease, and examination of lesions in the intestinal mucosa revealed many clumps of acid-fast bacteria. The intravenous johnin was heated to body temperature before being injected.

The reactions observed in a herd of twelve cattle are indicated in table III. Cow 11 showed clinical evidence of Johne's dis-

TABLE III—*Skin and temperature reactions following injection of johnin in a herd of 12 cattle.*

Animal	Sex	Skin Measurements (mm.)			Classification	Pre-Injection Temperatures (hours)			Johnin (cc)	Post-Injection Temperatures (hours)										Rise Following Injection	Classification
		Normal	After First Injection			4	2	1		1	2	3	4	5	6	7	8	9	10		
			48 hrs.	72 hrs.																	
1	F	9	9	9	N	1.8	1.8	1.8	5	1.6	1.8	1.8	1.8	2.0	2.2	1.8	1.6	1.8	1.6	0.4	N
2	F	6	6	9	N	2.0	1.6	1.8	5	1.6	1.8	1.8	2.2	2.4	2.6	2.8	2.4	2.4	2.2	0.8	N
3	F	6	6	8	N	1.2	1.0	1.8	5	1.6	1.6	1.4	1.6	1.6	2.2	2.4	2.0	2.4	2.2	0.6	N
4	F	7	7	7	N	2.0	1.8	2.0	5	2.0	2.0	2.0	1.8	2.6	2.4	2.4	2.0	2.2	2.0	0.6	N
5	F	5	5	7	N	2.2	1.8	2.4	5	2.6	2.8	3.2	3.0	3.2	3.0	3.0	2.4	2.6	2.6	0.8	N
6	F	6	6	8	N	1.4	2.4	2.4	5	2.0	2.0	2.2	2.0	2.6	2.6	2.6	2.2	2.4	2.4	0.2	N
7	F	5	9	13	R*	2.2	2.4	1.8	5	1.2	1.4	1.4	1.8	1.8	2.2	2.4	2.2	2.2	2.0	0.0	N*
8	F	7	7	9	N	1.2	1.8	1.6	5	1.2	1.6	1.8	1.4	2.0	2.0	2.0	2.0	1.8	2.0	0.2	N
9	F	6	6	7	N	1.8	1.6	1.6	5	1.4	2.0	1.6	2.0	2.0	2.4	2.6	2.4	2.4	2.4	0.8	N
10	F	7	7	9	N	1.4	1.4	1.0	5	1.4	1.6	2.6	2.2	2.0	2.4	1.8	1.8	1.8	1.6	1.0	N
11	F	5	8	9	S†	2.2	1.8	2.2	20	3.4	4.2	4.8	5.6	5.0	4.4	3.6	3.4	2.0	2.0	3.4	R†
12	M	13	13	13	N	1.8	1.0	1.4	10	1.0	1.0	1.0	1.2	1.6	1.6	1.8	1.6	1.6	1.4	0.0	N

S = suspicious.

*Slight lesions of Johne's disease at autopsy. Microscopic examination of intestines and lymph-glands for Johne's organism negative.

†Clinical case. Marked lesions of Johne's disease at autopsy. Microscopic examination of intestines and lymph-glands for Johne's organism negative.

TABLE IV—*Skin and temperature reactions following injection of johnin in a badly infected herd.*

Animal	Sex	Skin Measurements (mm.)			Classification	Pre-Injection Temperatures (hours)			Johnin (cc)	Post-Injection Temperatures (hours)									Rise Following Injection	Classification
		Normal	After First Injection																	
			48 hrs.	72 hrs.		4	2	1		1	2	3	4	5	6	7	8	9		
1	F	5	20	24	R*	1.4	1.6	1.6	10	2.0	1.6	1.6	1.8	2.2	2.2	2.4	2.2	1.8	0.8	N*
2	F	5	13	13	R†	1.0	0.8	1.4	10	1.4	1.0	1.4	1.0	2.0	1.8	2.4	2.0	2.0	1.0	N†
3	F	5	7	8	S	1.6	2.0	1.8	5	1.6	1.2	1.6	1.4	1.8	2.0	2.0	2.4	2.4	0.4	N
4	F	8	9	9	N	1.4	2.0	2.0	5	1.4	1.4	2.0	2.0	2.2	2.4	2.2	2.2	2.4	0.4	N
5	F	8	10	10	N	1.2	1.8	1.4	5	1.2	1.0	1.4	1.2	0.8	1.0	1.0	1.4	1.6	0.0	N
6	F	8	12	14	S	2.0	1.6	1.8	5	1.4	1.8	2.0	2.2	2.6	2.6	2.2	2.4	2.4	0.6	N
7	F	6	8	8	N	1.4	1.6	1.6	5	1.6	1.2	1.4	1.2	1.2	1.6	1.4	1.6	1.4	0.0	N
8	F	7	17	21	R‡	1.4	1.6	1.4	10	1.4	1.2	1.6	1.4	1.4	2.4	2.4	2.0	2.0	0.8	N‡
9	F	7	9	9	N	1.0	1.2	1.0	5	1.0	1.0	1.6	1.0	0.8	1.4	1.6	1.6	1.6	0.4	N
10	F	6	12	12	R†	1.4	2.0	2.0	10	3.0	4.0	4.6	4.2	3.0	2.6	2.8	2.2	2.4	2.6	R†
11	F	8	10	9	N	1.0	1.2	1.0	5	1.0	0.8	1.0	1.2	1.0	1.4	1.6	1.8	1.8	0.8	N
12	F	5	7	7	N	1.4	1.4	1.6	5	1.6	1.8	1.6	1.6	2.0	1.8	2.2	2.2	2.0	0.6	N
13	F	7	12	17	R†	1.0	1.8	1.6	10	1.4	1.4	2.4	2.6	3.6	4.4	3.4	3.0	2.4	2.6	R†
14	F	6	8	8	N	1.6	2.0	2.0	5	1.8	1.8	1.6	1.6	1.6	1.6	1.6	1.8	2.0	0.0	N
15	F	7	10	11	N	2.0	1.8	1.4	5	1.6	1.6	2.0	1.8	2.0	2.0	2.2	2.0	2.2	0.2	N
16	F	7	7	8	N	1.4	2.0	1.6	5	1.4	1.6	1.4	1.6	1.8	2.0	2.0	2.2	2.2	0.2	N
17	F	6	7	7	N	1.0	1.4	1.2	5	1.2	1.0	1.4	1.2	1.2	1.6	1.6	1.6	1.8	0.4	N
18	F	5	9	8	S	1.4	1.6	1.2	5	1.2	1.0	1.4	1.0	1.0	1.2	1.6	1.2	1.0	0.0	N
19	F	5	8	8	S	1.2	1.4	1.6	5	1.6	1.6	1.6	1.6	1.4	1.4	1.4	1.4	1.6	0.0	N
20	F	7	10	10	N	1.8	2.2	1.8	5	1.8	2.0	2.2	2.0	2.6	2.8	2.8	2.6	2.6	0.6	N
21	F	4	6	6	N	2.2	2.2	2.4	5	2.0	1.8	1.8	1.6	2.0	1.8	1.6	1.8	2.0	0.0	N
22	F	6	7	7	N	1.4	2.0	2.0	5	1.6	1.8	2.2	2.0	2.0	2.4	2.0	2.2	2.4	0.4	N

*Clinical case. Slight lesions of Johne's disease at autopsy. Microscopic examination of intestines and lymph-glands for Johne's organism positive.

†Clinical case. Marked lesions of Johne's disease at autopsy. Microscopic examination of intestines and lymph-glands for Johne's organism positive.

‡Clinical case. No lesions of Johne's disease at autopsy. Microscopic examination of intestines and lymph-glands for Johne's organism positive.

TABLE V—*Skin and temperature reactions following injection of johnin in a herd of 10 cattle.*

Animal	Sex	Skin Measurements (mm.)			Classification	Pre-Injection Temperatures (hours)			Johnin (cc)	Post-Injection Temperatures (hours)										Rise Following Injection	Classification
		Normal	After First Injection			4	2	1		1	2	3	4	5	6	7	8	9	10		
			48 hrs.	72 hrs.																	
1	F	10	13	11	N	1.6	1.4	1.6	5	1.4	1.4	1.4	1.6	1.6	2.0	2.4	2.0	2.2	2.2	0.8	N
2	F	5	8	8	S	1.4	1.2	1.0	5	0.6	0.8	1.0	1.6	1.6	2.0	2.0	2.2	2.4	2.2	1.0	N
3	F	5	8	7	N	0.4	0.8	0.8	5	1.0	1.0	1.2	1.2	1.6	1.6	1.6	2.0	2.0	1.8	1.2	N
4	F	5	7	6	N	1.2	1.4	1.2	5	0.6	1.0	1.4	1.8	1.6	1.6	1.8	2.0	1.8	1.6	0.6	N
5	F	8	16	16	R*	1.8	2.0	1.8	5	1.6	1.8	1.6	2.0	2.4	2.8	2.6	2.2	2.4	1.8	0.8	N*
6	F	5	6	7	N	0.6	0.8	1.0	5	1.4	1.2	1.6	1.8	1.6	2.0	2.2	2.2	2.2	1.8	1.2	N
7	F	6	8	7	N	1.0	1.0	1.2	5	1.2	0.8	1.6	1.4	1.4	2.2	2.2	2.2	1.8	1.8	1.0	N
8	F	4	10	7	N	3.2	3.2	2.8	5	2.2	1.8	1.4	1.6	1.6	1.6	2.0	2.2	2.0	2.0	0.0	N
9	F	6	9	9	N	0.6	1.2	1.2	5	1.4	1.6	1.6	1.6	1.8	2.2	2.0	2.2	2.2	2.0	1.0	N
10†	F	6	10	8	N	1.2	1.6	1.2	10	1.4	1.2	1.6	1.6	1.8	1.8	2.0	2.0	2.0	1.6	0.4	N

*Microscopic examination of intestines and lymph-glands for Johne's organism negative.
†Suspected of having Johne's disease.

ease at the time the tests were made. This cow had been in the herd for about fifteen months and was procured from a herd in which the disease had existed for years.

The results obtained in a badly infected herd are given in table IV. Five of the animals in this herd revealed symptoms of Johne's disease at the time the tests were conducted and the history indicated that the infection had been present for many years.

The reactions observed in a herd of ten cattle are indicated in table V.

Discussion of Tables II, III, IV and V

The four herds had a total of 64 cattle, of which 3 (4.6 per cent) gave positive reactions and 48 (75 per cent) were negative to both the intradermal and intravenous tests. One cow was a reactor to the intravenous test and suspicious to the intradermal test. Seven cattle gave positive reactions to the intradermal test and failed to react to the intravenous test. Five cattle, giving suspicious reactions to the intradermal test, were negative to the intravenous test. Positive reactors to the intradermal or intravenous johnin tests, from four herds totaling 21 cattle, are shown in table VI. Two animals (15 and 17) revealed clinical evidence of Johne's disease.

The results obtained with the two tests and autopsy findings in sixteen of the cattle, from four herds, are indicated in table VII. The cattle were either positive or suspicious reactors to the intradermal or intravenous test. Five animals (1, 2, 3, 13 and 16) showed clinical symptoms of Johne's disease.

Discussion of Tables VI and VII

These tables show reactors to the intradermal or intravenous johnin test observed in eight herds. The eight herds had a total of 129 cattle, of which 9 (6.9 per cent) gave positive reactions and 77 (59.6 per cent) were negative to both the intradermal and intravenous tests. Two cows were reactors to the intradermal and suspicious to the intravenous tests. Five cattle were reactors to the intravenous and suspicious to the intradermal. One cow was suspicious to both tests. Six cattle gave positive reactions to the intradermal test and failed to react to the intravenous test. Fourteen gave positive reactions to the intravenous test and failed to react to the intradermal test. Ten cows, giving suspicious reactions to the intradermal test, were negative to

TABLE VI—*Skin and temperature reactions following injection of johnin in 4 herds containing 21 cattle.*

ANIMAL	SEX	SKIN MEASUREMENTS (MM.)		CLASSIFICATION	PRE-INJECTION TEMPERATURES	JOHNIN (CC)	POST-INJECTION TEMPERATURES (HOURS)								RISE FOLLOWING INJECTION	CLASSIFICATION
		NORMAL	AFTER INJECTION 72 HRS.				1	2	3	4	5	6	7	8		
1	F	8	12	N	1.8	5	2.4	3.0	2.2	3.2	4.6	4.6	4.4	3.0	2.8	R
2	F	7	15	R	0.8	5	1.4	1.8	2.0	1.8	1.6	3.0	1.8	2.4	2.2	R
3	F	7	8	N	0.8	5	2.4	3.0	4.0	3.4	3.6	2.8	3.0	2.6	3.2	R
4	F	7	12	S	1.0	5	1.0	1.4	1.8	1.4	1.4	3.2	3.2	3.4	2.4	R
5	F	8	11	N	2.0	5	2.0	2.6	2.2	3.4	4.0	5.8	6.6	6.6	4.6	R
6	F	10	12	N	2.0	5	3.6	4.0	3.6	3.6	3.2	2.0	2.0	2.0	2.0	R
7	F	7	9	N	1.4	5	1.8	3.6	3.4	3.0	3.2	2.8	2.4	2.6	2.2	R
8	F	7	9	N	2.4	5	3.2	3.0	2.4	3.4	4.2	4.4	3.4	3.4	2.0	R
9	F	9	25	R	2.4	10	2.4	2.8	3.4	3.4	3.0	4.2	3.0	1.4	1.8	R
10	F	9	11	N	1.4	10	2.0	2.6	3.4	3.4	3.4	5.2	4.2	3.0	3.8	R
11	F	9	20	R	1.4	10	2.0	3.4	4.0	5.4	6.4	6.0	5.2	4.2	5.0	R
12	F	5	17	R	2.0	10	2.2	3.4	3.4	2.6	3.0	2.8	3.0	3.0	1.4	S
13	F	6	17	R	1.6	10	1.8	2.0	2.0	2.4	2.2	2.6	2.4		1.0	N
14	F	6	14	R	1.2	20	2.2	2.8	3.4	3.6	3.2	2.8	2.8	2.4	2.4	R
15*	F	7	12	S	0.8	20	0.4	0.8	1.2	1.6	2.4	3.0	3.0	3.0	2.2	R
16	F	8	15	S	1.6	20	1.8	2.0	3.2	3.6	4.2	3.8	3.6	3.6	2.6	R
17*	F	9	27	R	1.6	20	2.0	3.0	3.0	3.0	3.4	3.0	2.8	2.6	1.8	R
18	F	9	17	S	2.0	15	3.0	3.2	3.4	2.4	3.0	3.8	3.8	4.0	2.0	R
19	F	10	10	N	1.4	5	2.4	3.4	3.6	3.0	2.8	2.6	2.6	1.8	2.2	R
20	F	7	15	R	0.4	5	1.6	2.4	2.2	2.6	2.0	2.0	1.8	1.2	2.2	R
21	F	9	11	N	1.4	5	2.0	3.6	3.8	2.8	3.6	2.6	2.4	1.6	2.4	R

*Clinical cases.

TABLE VII—*Skin and temperature reactions following injection of johnin in 4 herds containing 16 cattle.*

Animal	Sex	Skin Measurements (mm.)		Classification	Pre-Injection Temperatures	Johnin (cc)	Post-Injection Temperatures (hours)								Rise Following Injection	Classification	Micro. Exam.*
		Normal	After Injection 72 hrs.				1	2	3	4	5	6	7	8			
1†	F	8	13	S	2.0	15	3.2	4.4	4.4	5.2	4.4	3.4			3.2	R	+
2†	F	8	8	N	1.8	20	3.2	3.6	2.4	2.6	2.4	2.4	2.0	1.8	1.8	R	+
3†	F	8	14	N	2.2	20	2.0	3.0	4.4	6.2	6.4	5.4	4.0	2.0	4.2	R	−
4	F	6	12	R	1.6	10	1.8	3.2	2.4	2.2	2.2	2.6	2.4		1.6	R	−
5	F	9	19	R	2.0	10	2.2	2.6	2.6	2.6	2.0	2.6	2.2		0.6	N	+
6	F	8	21	R	2.2	10	2.2	2.0	2.0	2.0	2.2	2.4	2.2		0.2	N	+
7	F	7	9	N	2.2	5	3.0	3.4	4.2	4.2	4.2	4.6	3.8		2.4	R	+
8	F	7	14	R	1.8	10	1.8	1.4	1.4	2.4	2.0	2.8	2.2		1.0	N	+
9	F	6	12	R	1.8	10	2.2	3.0	3.4	3.4	2.8	2.8	2.6		1.6	R	+
10	F	6	12	R	1.2	10	1.8	2.0	2.4	2.4	2.2	2.6	2.4		1.4	S	−
11	F	5	7	N	1.8	5	2.0	3.4	5.0	2.8	2.4	2.2	2.0		3.2	R	+
12	F	7	18	R	2.0	10	2.0	1.8	1.8	1.8	2.0	2.0	2.2	2.6	0.6	N	+
13†	F	5	6	N	2.0	10	2.0	1.8	1.8	2.6	3.2	3.0	4.0	4.2	2.2	R	−
14	F	7	20	R	1.6	20	2.6	5.6	6.6	5.8	5.6	4.8	4.4	4.0	5.0	R	+
15	F	11	30	R	2.0	10	2.2	2.4	1.6	2.2	2.2	2.6	2.2	2.4	0.6	N	−
16†	F	7	13	S	1.0	15	1.4	1.8	1.6	2.0	1.8	2.4	2.0	2.0	1.4	S	+

*Examination of intestines and lymph-glands for Johne's organism.
†Clinical cases.

the intravenous test. Five cattle, giving suspicious reactions to the intravenous test, were negative to the intradermal test.

Discussion

The prolonged incubation of cultures of Johne's organism used for the production of the intradermal johnin was considered desirable to obtain the maximum growth and for many of the organisms to die and autolyze. Cumming[8] has shown that the active principle of tuberculin is most completely liberated from the cells of *Myco. tuberculosis* by extraction at low temperatures. The work of Vallée and Rinjard[3] indicated that a johnin prepared by extraction of the culture in the cold is a satisfactory diagnostic agent.

Of the 312 cattle tested by the intradermal johnin test, 193 (61.8 per cent) were tested by the intravenous method. Twelve (6.2 per cent) of the 193 cattle were reactors to both tests and 125 (64.7 per cent) did not react to either test. One cow gave suspicious reactions to both tests. There was a disagreement between the two tests in 55 (28.4 per cent) of the cattle.

Marked variations in the macroscopic appearance of the infected intestines were observed on postmortem examination of the 26 reactors to the intradermal or intravenous test and the cow suspicious to both tests, indicated in tables II, III, IV, V and VII. The extent of the gross lesions of Johne's disease was no evidence as to the number of acid-fast organisms which could be demonstrated on microscopical examination. Beach and Hastings[9] also found that acid-fast organisms may be numerous in the intestines with slight lesions and were occasionally difficult to demonstrate in material manifesting extensive lesions. Only those cases in which acid-fast organisms occurred in clumps or nests in the mucous membrane of the intestines and in the mesenteric lymph-glands were considered as being positive, and usually the specific organism was present in large numbers. Methods of concentrating the organisms were not used in the examination of the material. The Johne organism was demonstrated microscopically in the intestines and lymph-glands of twelve cattle classed as reactors to the intradermal johnin test, in eight reactors in the intravenous test, and in the cow suspicious to both tests. No acid-fast organisms were found in seven reactors to the intradermal and five reactors to the intravenous test. The organisms were demonstrated in three cattle negative to the intradermal and eight negative to the intravenous test.

The results obtained with the intradermal johnin test indicate that it is as valuable as the intravenous test in detecting Johne's disease in cattle. When both the intradermal and intravenous tests were used, the results more nearly agreed with the post-mortem findings than if either test were used alone.

The field work reported was conducted by one (A. E. F.) of the authors, who wish to acknowledge the assistance of Dr. E. D. Martin in the examination of the intestines and lymph-glands.

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Facts Concerning Rabies

The Massachusetts Veterinary Association has prepared a folder entitled, "The Control and Prevention of Rabies," intended for distribution among the laity. The material in the folder is in the form of questions and answers. These are given in non-technical language, and it is expected that it will be possible to secure the distribution of upwards of 100,000 copies to veterinarians, kennel clubs, boards of health and similar organizations. The folder can be obtained in quantities, at a cost of fifty cents per hundred copies, by communicating with the Secretary of the Massachusetts Veterinary Association, Dr. H. W. Jakeman, 44 Bromfield Street, Boston, Massachusetts. The folder has been endorsed by the Massachusetts Department of Health, the Division of Animal Industry of the Massachusetts Department of Conservation and the Massachusetts Department of Agriculture.

Helen Keller said that if she could have but one glance through her sightless eyes, she would choose to see first a child—then a dog.

URETHROSTOMY AND URETHROPLASTY IN SMALL ANIMALS*

By J. D. COZZENS
Santa Monica, Calif.

Urethremphraxis and urethrostenosis are conditions seen occasionally in the dog and frequently in the male cat. In both animals these conditions usually are the result of calculi lodging in the urethra, or the conditions may follow operations for the removal of calculi. It is not necessary to discuss the serious consequences resulting from the retention of urine.

In the male dog the calculi usually lodge just proximal to the os penis or in the gutter of the bone. Removal of these by the usual manner of making an incision through the tissues just posterior to the os penis often results in damage to the urethra, and after this operation has been performed a few times urethremphraxis or urethrostenosis nearly always follows as healing takes place. In order to avoid destruction of the pet, which is inevitable in cases of this kind, I have performed the following operation with success.

The site of the urethrostomy is about midway between the ischial arch and the scrotum. This location is chosen for several reasons. The urethra is large here; in a 30-pound dog it is about the size of a lead pencil. It will permit the passing of calculi in this portion that would ordinarily block it lower down. Once calculi are formed, they often continue to do so regardless of treatment. With an opening at this point, many stones will pass which might ordinarily cause trouble. If the calculi becomes too large to pass out of the bladder, a urethrostomy at this site enables one to make a cystoscopic examination and remove the stones without further operation. If necessary, a lithotrite may be introduced and the stones crushed, followed by bladder lavage. I have used the Braasch cystoscope direct vision, 20 french.

The above location is also favorable for micturition. When the hair grows out, the artifical meatus is scarcely perceptible. Then, too, the operation at this point will not interfere with the sphincter. Urine is expelled with more or less of a gush but unless there is bladder irritation no more frequently than usual. The dog will raise his leg as if urinating naturally.

*Received for publication, April 25, 1932.

Operation in the Dog

If there are calculi lodged proximal to the os penis, these should be removed as follows. A greased metal probe is passed into the urethra until the stones are encountered. This is usually just at the proximal end of the bone. Grasping the organ in the left hand, the tissues are longitudinally severed down to the calculi. These are all removed, which is not always easy, as they are often embedded in the tissues. From this incision the urethra is located, the probe inserted anew at this point and passed up to the neck of the bladder. It is a good plan not to empty the bladder completely if it has been greatly distended.

Locating the ischial arch, an incision an inch long is made, the proximal end being slightly below the ischial arch. The incision is carried down through the tissues to the probe. The urethra is recognized as a pale, whitish membrane. It is deeply seated in this region. It is dissected out, down to the scrotum, care being taken to preserve the proximal one-half inch. The reason for removing such a length of the urethra is to prevent it from joining again completely, an inherent quality of this organ, and an attempt on the part of nature to establish the normal function of the tube again. Then, too, due to the distance of the urethra to the surface at this point, a considerable amount of the tissue is needed, as the proximal portion is brought out and sutured to the skin and subcutaneous tissue. This is not easily done. In a few days the sutures usually cut out.

In a couple of weeks, the aperture will have a tendency to heal over. It then will have to be stretched open. This stretching process may have to be done several times at intervals of two or three weeks before a permanent fistula is established. It is best accomplished by inserting a pair of pointed artery forceps into the fistula and opening the jaws. A little hemorrhage usually takes place when this is done.

Operation in the Cat

In the cat, the operation is much the same. Removal of the calculi in the penis is not often attempted, but they are allowed to remain there. The incision is made in the same location as in the dog. The posterior portion of the penis and urethra are observed when the superficial tissues are dissected away. Grasp the urethra and its surrounding tissues with an artery forceps and pull it slightly away from the arch. Then, with a pair of scissors, cut transversely through the entire structures above the forceps. Urine will then gush out of the urethra. It is

usually bloody and may contain small calculi of sand-like consistency. Do not completely empty the bladder but leave sufficient urine in the organ to measure one-third normal capacity. Leaving the forceps still attached to the posterior portion of the penis and the enclosed urethra, take a fine curved needle and silk or linen thread and suture the urethra, which has been severed and appears as a small tube, to the surrounding tissues and skin, one suture on each side. Then, with scissors, a transverse section of the urethra and posterior portion of the penis two-fifths of an inch long is removed below the urethrostomy. This is sufficient to prevent union of the urethra to the part remaining in the penis.

As in the dog, every ten days or two weeks, it will likely have to be stretched open, over a period of time not to exceed three months. The urethra eventually unites with the skin, making a permanent fistula.

Satisfactory recovery can be expected where the patient has not been overcome by uremia and where there are no complications. Urotropin should be given for at least a week following the operation or until the bladder is cleaned up.

Virginia Veterinarians Broadcast

Radio talks on subjects of interest to live stock owners are being broadcast once a month by past presidents of the Virginia State Veterinary Medical Association, at the Virginia Polytechnic Institute.

Thus far three 15-minute talks have been given. In September Dr. H. C. Givens, of Richmond, spoke on "The Duties of a State Veterinarian." The October talk was by Dr. G. C. Faville, of Richmond, on "Controlling Infectious Diseases." Dr. E. A. Robinson, of Petersburg, spoke in November.

The broadcasts are on the last Saturday of each month between 12:30 and 1 p. m., over Station WDBJ, at Roanoke (wave length, 930 kilocycles).

Hail to the Chief

Dr. N. F. Williams was greeted by a group of veterinarians when he arrived in Fort Worth from the A. V. M. A. meeting. Texas veterinarians are proud to honor him as the standard-bearer for the profession. His ability and loyalty will make him one of the outstanding presidents of the national organization. Congratulations, Chief Williams, and best wishes to you from the readers of Texas News Notes!

—W. R. McCuistion in *Jen-Sal Journal.*

ERGOTISM OF CATTLE IN KANSAS*

By J. W. LUMB, *Manhattan, Kansas*
Kansas State College

INTRODUCTION

Ergotism has rarely been reported as causing much trouble in cattle in Kansas, although a few reports are to be found of instances where one or two animals of a herd were affected.

Possibly the first time that ergotism was definitely diagnosed in Kansas as appearing in an epizoötic form was in 1884. Faville[1] then reported the appearance of a strange disease at Neosho Falls, Kansas, called by the newspapers, "foot-and-mouth disease." Thousands of cattle were running on the plains of the West and everybody was afraid. Other States were quarantining against Kansas and there was great excitement all over the cattle country. Probably there have never been so many affected animals in the State at one time since that period.

Sollman[2] states that ergotism in people was formerly very frequently caused by ergot in flour and the population of large tracts of the country have been poisoned. The last large epidemic in the United States occurred in New York in 1825.

HISTORY

On March 24, 1932, the writer visited a farm in northeastern Kansas. The owner of the farm stated that some time in January, 1932, his cows began to show signs of nervousness, slight lameness and soreness of the feet. These cows were running in a corn-stalk field and getting a very small amount of prairie hay. The owner took very little notice of the condition at first but, after about a month, the condition of the animals became more aggravated, so he called a local veterinarian. The veterinarian told the owner his cattle showed some symptoms of ergotism and inquired whether he was feeding hay which contained

*Presented at the sixty-ninth annual meeting of the American Veterinary Medical Association, Atlanta, Ga., August 23-26, 1932.

wild rye. The owner replied that the cattle had been running on the corn-stalk field and getting no hay which contained wild rye, so withdrawal of the herd from the field was recommended. This was done, the cows being fed some corn stover, but considerably more of the prairie hay. The condition of the animals continued to get worse until the owner applied to the State Livestock Sanitary Commissioner for assistance. Dr. H. Farley made an investigation of the trouble and diagnosed ergotism.

FIG. 1. Sloughing of the hind legs in two cows affected with ergotism.

SYMPTOMS AND LESIONS

The herd originally consisted of 27 cows, three of which had calves at their sides. When visited on March 24, 1932, ten of the cows had become unable to rise and were so emaciated that they had been killed. Another was in that condition and it was recommended that it be killed. All the remaining animals, including the calves, had lost either one or both claws of the hind

FIG. 2. Rye containing ergot (*Claviceps purpurea*).

feet, but could still rise and hobble around. One cow's hind feet were off at the fetlock. One of the cows which had been killed had lost her foot and part of the leg, these sloughing off at the hock. There was extensive swelling of the legs for several inches above where sloughing of the members took place, as shown in figure 1. A rather clear line of demarcation showed where the circulation of the blood was shut off from the affected parts, and dry gangrene caused the loss of the member without hemorrhage and with very little apparent pus formation. All of the animals had lost the tail-switch. None had lost front feet or claws, although their feet seemed sensitive and the fetlocks were somewhat swollen. On June 6, 1932, several more of these animals had been killed.

Sixteen yearlings had been kept separate from the cows, as they were being fattened for market. No prairie hay had been fed to them until after the cows had been affected. Within a week after the first feeding they began to stamp their feet and show nervousness, and as they were in market condition, they were sold immediately.

Law[3] indicates that ergotism may cause stomatitis, shown by simple sores in the interdigital spaces; sores may appear also upon the teats, and the outer borders of the ears may slough. None of these symptoms developed in this herd.

Diagnosis

It is known that ergot (*Claviceps purpurea*) develops as a fungus upon grains such as rye, wheat and barley, and upon many types of grass, such as blue grass, red top, timothy, wild rye, brome, quack grass, western wheat grass, needle grass and possibly on other kinds of grasses. An investigation of the prairie hay being fed to the cows showed that it was badly mixed with wild rye.

Practically every head of rye contained ergot, as shown in figure 2. When the herd was taken off the stalk field they had eaten more hay and so all became ergotized.

Control of Ergot

Brentzel[4] reports there are three principal ways of controlling the development of ergot: (1) Sow ergot-free seed. (2) Practice crop rotation. (3) Mow or burn the wild grasses and volunteer grain along the roadsides and edges of the field before or while they are in blossom. The latter practice will assist in avoiding this trouble in prairie hay.

TREATMENT

All the animals in this herd were so badly affected when observed that no treatment was advised except that all ergot-bearing hay should be withheld and that the ordinary ration should include some good alfalfa hay and bran.

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CARCINOMA OF THE OVARY IN AN ELEPHANT (ELEPHAS INDICUS)*

By A. L. DELEZ, *LaFayette, Indiana*
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Purdue University Agricultural Experiment Station

This report is based on a study of a neoplastic ovary and portions of the liver and lungs of an elephant brought to this laboratory by Dr. W. E. Muldoon, of Peru, Indiana. The animal was brought from India, thirty-five years ago, and had been ailing for the past five years.

Symptoms: There were periodic attacks of abdominal pain and manifestations of cachexia developed, especially loss of weight and anemia.

Autopsy: Considerable sanguineous fluid was found in the abdominal cavity.

The ovary consisted of a large, white mass with a lobulated surface. It weighed about fifty pounds. The cut surface was firm and smooth. There were some round, firm nodules in the portion of the liver examined, the cut surfaces of which were similar in appearance to the ovarian tissue. A marked grittiness was observed upon examination of the lung tissue, which bore no resemblance to the condition of the ovary.

Histopathology: The normal ovarian tissue was replaced by a rapidly growing undifferentiated neoplasm. The character of the growth was suggestive of a carcinoma. Sections from the liver nodules showed the same type of cells as those in the ovarian

*Received for publication, October 8, 1932.

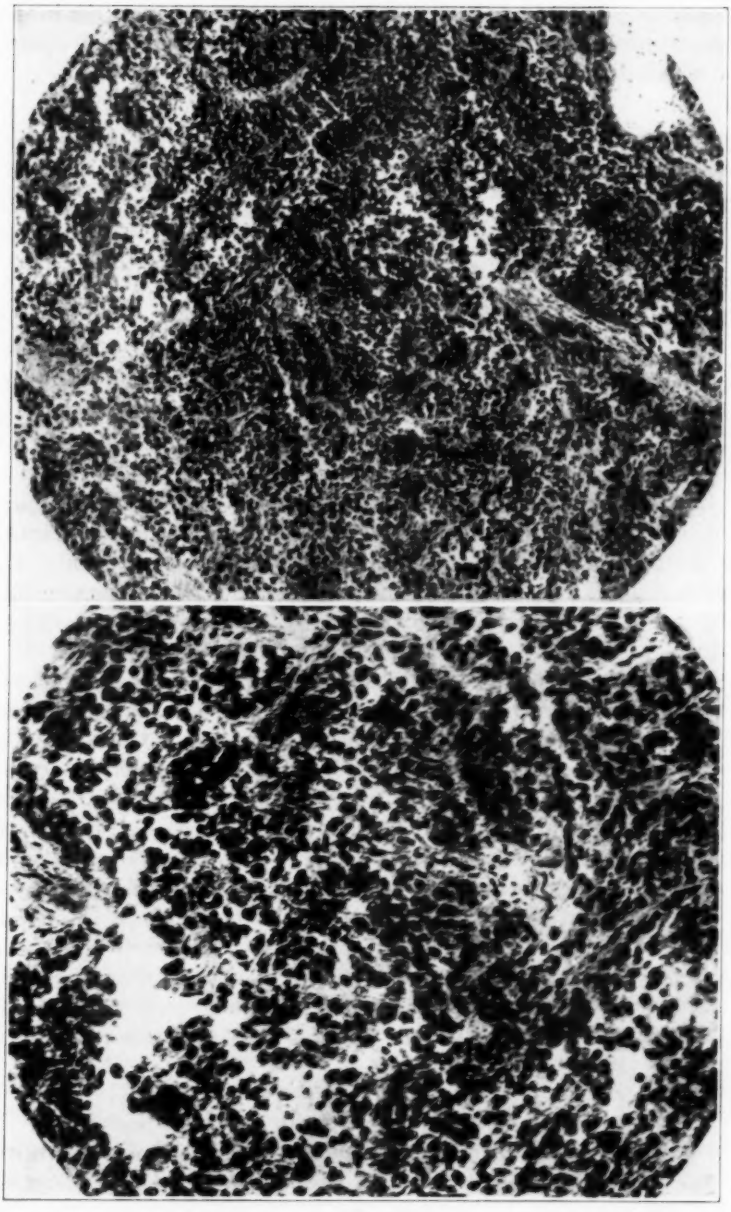


FIG. 1 (above). Section of carcinoma showing character of ovarian neoplasm.

FIG. 2 (below). Section of carcinoma showing mitotic figures and multinucleated cells.

neoplasm. The lungs were involved by a chronic, fibrous, inflammatory process with considerable calcium deposition. No specific bacterial or parasitic agent was demonstrable.

LIP-AND-LEG ULCERATION IN SHEEP WITH REPORT OF TWO CASES IN MAN*

By T. O. BRANDENBERG, *Lakota, N. Dak.*

DISCUSSION

Necrobacillosis of sheep is a term used to designate a skin disease caused by *Actinomyces necrophorus*, generally aided by and very often dependent, for its ultimate disease rôle, upon certain unusual conditions in the environment or food. Mixed infection is the rule, various types of streptococci or staphylococci usually being found in the later stages of the disease.

It has been called sore mouth (stomatitis) by some, but since the lesions about the lips are only a part of the disease picture in many of the severer outbreaks, we like Mohler's name "lip-and-leg ulceration," as being more descriptive of the disease than any other, and one that can be readily understood by the sheepmen.

There has been some discussion as to the underlying cause, as it seems to occur most commonly in sheep that have been shipped or that for some reason are in poor condition or are on food containing sharp spines or beards that actually inoculate the infection into the skin.

When shipped sheep become involved, they often transmit the disease to native bands with which they come in contact, indicating that the causative organism, like many others, when in a suitable environment, increases its virulence greatly, and may attack other animals and man, producing lesions in the latter that possibly are not serious, but are troublesome and unusual. On account of the mixed infection that is usually present, the condition may incapacitate an infected person for some time.

SYMPTOMS

Small papules develop on the outside of the lips, around the commissures, and in most cases more on the lower than the upper lip; above the coronets, on the inside of the limbs; on the ears and possibly the genitals and udder.

The lesions about the lips soon become raw, due partly to the

*Received for publication, November 7, 1932.

necrosis and the eating of roughage. In other parts they are covered by a thick, grayish-brown crust. The lips by this time are swollen and rigid, and in some cases the nostrils and face, making breathing difficult or even impossible.

Each animal in an infected band shows some variation in the severity and the location of lesions, though the lips are the most constant site.

Handling

Quarantine should be rigidly maintained until the disease is controlled, and a careful examination of the entire band should be made before they are released. Provide the softest and best food possible. We have found this very important.

Catch each sheep and carefully examine it. Scrape off the necrotic areas and paint with a 2 per cent solution of potassium permanganate. Use a swab made out of sheep wool, around which a wire is twisted. This absorbs the solution splendidly and does not mat up as a swab made out of any other material will.

Destroy all old, debilitated ewes and any others, regardless of age, where necrosis becomes difficult or impossible to control. Handling the entire flock once and a few of the worst cases two or three times in this manner should do and usually does the work, if suitable food is provided and if weather conditions are favorable. Considerable losses have been sustained when the disease occurred during the winter months and the forage procurable was poor. If the condition is not corrected before lambing time, great losses may occur in the lambs from a severe necrosis of the mouth with inability to nurse and possibly involvement of the digestive tract. The ewes suffer udder lesions and infections of the gland, and a few die from this cause.

Case Report

The most severe outbreak we have seen occurred the past summer in a flock of 500 sheep ranging in age from broken-mouth ewes to spring lambs. The condition was severe when first noticed on September 6. Many of the older sheep were so swollen about the face and nostrils that they had great difficulty in breathing. There were typical lesions about the lips.

The flock was quarantined in a large feed-lot and not allowed on the fields on account of the great prevalence of short, dead Canadian thistles, which were very sharp and readily punctured the skin. Four men began treatment of this flock on September 7. Two acted as catchers and assistants and two carefully in-

spected all parts of the sheep, treating them as conditions demanded. Before the first half of the flock had been treated, the condition had developed to such an extent that it was deemed advisable to check over all that had been handled, on account of new lesions developing on the udders of the ewes on the inside of the limbs, and on the ears of the lambs.

The first handling of this flock took three days and, a few days later, both men who had been doing the treating began to develop lesions on their hands and one on the arms to the elbows and on the legs to the knees. Large lentil-like nodules appeared, which were slightly painful. There was a deep smarting or itching sensation if they were pressed upon or irritated in any way. There was swelling of the neighboring lymph-glands.

One of these men was a student at the State College and returned to school in a few days. We asked him to have the bacteriologist make an examination of his hands, which was done on his arrival. Dr. Nelson did the work and he states that an anaërobe was present, but on account of the rich mixed infection present he was unable to isolate the organism and identify it.

Cows on this farm developed lesions on the teats and some of the calves showed lesions on the neck. One presented lesions on the genitals. The cows occupied a common yard with the sheep, and the pastures, due to a long period of drouth, were simply a mass of half-dry, short Canadian thistles. This condition, more than any other, accounted for the severity of this outbreak and its spread to other animals and man. In many of the lesions on the hands of one of the men, we found small thorns. The sheep were entirely well in five weeks and were releasd from quarantine apparently no worse for their experience, except that many of the lambs had lost one or both ears, these having almost entirely sloughed away.

As we had been asked previously concerning the danger to man in handling these sheep and we had replied that there was no danger, we were put in rather a bad position when the two men became affected.

It must be uncommon, however, as veterinary and medical literature record very few cases and apparently consider it of little or no importance. We find, on page 626, of Hutyra and Marek, vol. III, the following:

> In an enzoötic in the Prussian district of Wittenberg, the shepherd was also infected by the affected sheep, and large lentil-sized nodules formed on his hands, which in 3 to 4 days changed into small ulcers and healed up in about 10 days.

CELLOPHANE IN FRACTURES*

By C. L. SANDERS, *Dayton, Ohio*

The mention of the use of cellophane in veterinary surgery, in the November issue of the JOURNAL, was noted with interest. Just recently I had a part Chow-German Shepherd male dog with a bad fracture of the radius and ulna above the wrist. There was also a bad wound, half-moon in shape, extending to the bone. I happened to think of cellophane and, realizing its tensile strength, I used it for a window in the splint dressing consisting of yucca board, gauze bandage and adhesive tape. Metaphen (Abbott) was dispensed. I had the owner swab the wound with an applicator, every other day, and the results were wonderful. I might add also that some neighbors called the Humane Society, claiming that the animal should be killed. However, when investigation disclosed how the fracture and wound had been taken care of, there was no complaint.

The wound healed, of course, before the fracture and in two weeks the splints were taken off and there was an uneventful recovery. It might be added that the sheets of cellophane cost ten cents.

DRACUNCULUS MEDINENSIS (LINNAEUS, 1758) APPEARS IN THE UNITED STATES AS A PARASITE OF THE FOX†

By E. A. BENBROOK, *Ames, Iowa*
Department of Veterinary Pathology, Iowa State College

From time to time, parasites new to this country make their appearance, many of them creating problems of considerable importance as they spread from animal to animal. Veterinarians and physicians should be interested, therefore, in the finding of the nematode worm *Dracunculus medinensis* in the subcutis of a fox; especially so because this parasite has for centuries been a serious problem in man and live stock in certain other parts of the world. Moses warned the children of Israel of a "fiery serpent" to be met with in the wilderness and it is thought that he referred to this worm, which later came to be known as the Guinea worm or Medina worm. Baylis[1] and Faust[2] state that the parasite occurs especially in Arabia, Persia, Turkestan, India, Africa, South America, Fiji and the West Indies. Besides

*Received for publication, November 9, 1932.
†Received for publication, November 14, 1932.

man, the hosts hitherto reported include horses, cattle, dogs, leopards, monkeys and baboons.

Recently the writer received two female nematodes from Dr. M. Donahoe, a veterinarian, of Milford, Iowa. He stated that they were removed from beneath the skin of a year-old female silver black fox, *Vulpes fulva* (Desmarest). The following history was submitted:

The animal was in poor condition and had never mated.

FIG. 1. Adult female *Dracunculus medinensis* (x 1. 4).

Numerous nodules, several centimeters in diameter, were found on the legs, mostly below the carpal and tarsal regions. Incision revealed the fact that each nodule contained from two to four worms and pus. Most of the worms were alive but a few were dead and partly disintegrated. At least ten scars were present

where nodules had ruptured and discharged their contents. No other foxes on the farm were similarly affected. This fox had been whelped and raised on the premises. The fox-pens were on gravelly soil, floored with sand, and there were no water-holes present. The drinking-pans were raised off the ground. The diet of the foxes included meat scraps procured from a local grocery and meat market and it was noted that portions of vegetables, bananas and other fruit were sometimes included with the meat.

About six weeks later, the fox was examined again, and three more female worms were found. Apparently more nodules were

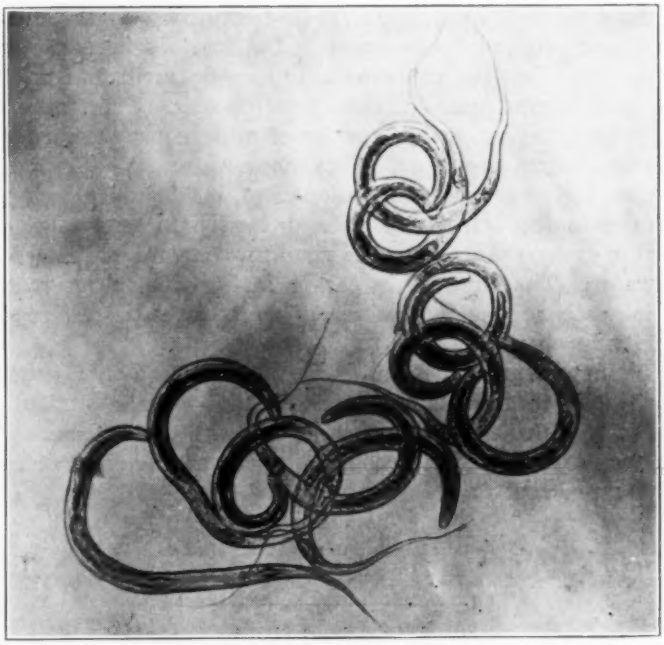


FIG. 2. Embryos of *Dracunculus medinensis* (x 150).

in the process of formation. The nodules were incised, drained and flushed with a disinfectant and, six months later, the fox was reported as free from parasites and in an improved condition. No further infestation has been noted in this group of foxes up to September, 1932.

Examination of the parasites showed them to have characteristics of the genus Dracunculus and a specific diagnosis of *Dracunculus medinensis* was made by Dr. B. G. Chitwood, assistant

zoölogist in the Zoölogical Division of the Bureau of Animal Industry, United States Department of Agriculture, to whom, also, specimens of the worm had been sent.

Outstanding characteristics of the female specimens found in the fox are as follows: length, from 25 to 34 cm. Maximum width, slightly less than 2 mm. (fig. 1). Color varies from white to yellowish. The major portion of the worm is occupied by the greatly distended uterus filled with embryos (fig. 2) which measure about 0.5 mm. in length. Many larvae were found adhering to the pus and blood on the exterior of the worms.

Nothing is definitely known regarding the life cycle of this worm as far as the fox is concerned. However, the life cycle in man may be used as a basis for conjecture as to the mode of transmission to and development in the fox. In man, the larvae are set free when the ruptured subcutaneous nodules containing the female worms come in contact with water. The larvae must then be ingested by certain species of minute crustaceans known as cyclops, commonly found in stagnant water. The larvae then enter the body cavity of the cyclops and, in about ten days, have developed to the infective stage. Infection in man takes place when the cyclops containing the young worms are swallowed with raw water. The larvae thus escape in the stomach or intestine and migrate to the subcutaneous connective tissue, reaching maturity in about one year.

It is important to determine the distribution and extent of this parasite in animals so that its habits may be studied with the object of preventing its spread to live stock and man. The writer will appreciate the coöperation of veterinarians or others who may find and report occurrences of this nematode.

REFERENCES

[1]Baylis, H. A.: A Manual of Helminthology, Medical and Veterinary. (London, 1929), p. 222.
[2]Faust, E. C.: Human Helminthology. (Philadelphia, 1929), p. 472.

Profitable Mice

Selling 3,000 white mice per week at 4c each has proved a lucrative business for William Wilson, ex-chemist of Springfield, Mo., who found himself more or less of an invalid after the War, and unfit for strenuous labor. Someone suggested that he raise white mice for scientific experiments. He began two years ago with 20 mice, and now has 35,000, all fertile. They are purchased by jobbers who sell them to various laboratories.

The mousery consists of rows of double-decked boxes, 15x27 inches, which contain 200 mice per row. The mice are usually sold when three-fourths grown; they then weigh about 25 grams.

REPÚBLICA ESPAÑOLA. Dirección General de Ganaderia e Industrias Pecuarias. (Republic of Spain. General Direction of Cattle Breeding and Animal Industries.) 142 pages. Illustrated. Asociación Nacional Veterinaria Española, Madrid, 1932.

The appraisal of veterinary science by the organizers of a new government during this, the second quarter of the twentieth century, is exemplified in this official publication recently issued by the Republic of Spain. The document describes the organization of the veterinary service of the new republic in such a detailed way as to recognize the importance now placed upon animal production and the control of animal diseases by the makers of a modern nation.

The general plan is to bring under veterinary control the technical, scientific and economic enterprises concerned, and to develop these under three grand divisions for administrative purposes: (1) education and promotional work, (2) animal production, investigation and observation, and (3) hygiene and sanitation. The new republic places each of these divisions unreservedly under the direction of "Veterinary Inspector Generals."

Says the introductory summary:

> We already know the splendid results the United States Bureau of Animal Industry has obtained for the benefit of the stock-raising industry of that great American nation, but, without trying to boast, we think the Spanish organization will realize a more complete work . . . and show the magnificent part the veterinarian is destined to play in modern economic life.

In this preamble is expressed the spirit of La Asociación Nacional Veterinaria Española which, in effect, has control of the new service.

The veterinary inspector general of education and promotion has charge of the veterinary schools and is responsible for their development, in the decree, which provides for the maintenance of four schools, at Madrid, Zaragoza, León and Córdova, or at points adjacent thereto, where there is access to breeding centers, abattoirs, etc.

A baccalaureate degree is the minimum requirement for admission and the course consists of five collegiate years, each divided into two semesters. To obtain the title of "ingeniero pecuario" (animal engineer), an additional year must be taken at the veterinary school of Madrid. The branches prescribed are:

First year: First semester: Mathematics, inorganic chemistry, geology, botany, normal histology, German. Second semester: Physics, organic chemistry, biology, practical analytical chemistry, zoölogy, embryology, anatomy of meat animals and fowl, dissection, German.

Second year: First semester: Genetics, anatomy of solipeds, dogs and cats, dissection, agriculture and forestry, general bacteriology. Second semester: Physiology, feeding, special bacteriology, parasitology, German.

Third year: First semester: Physiology, hygiene, special bacteriology, immunology and preparation of serums and vaccines, clinical diagnosis, pharmacology and pharmacodynamics, German. Second semester: Histopathology, pathological anatomy, special pathology of meat animals and fowl, ambulatory clinic, infectious and parasitic diseases, therapeutics, toxicology, German.

Fourth year: First semester: Infectious and parasitic diseases, special pathology of sporadic disease of solipeds, dogs and cats, German. Second semester: Surgery, obstetrics, theratology, general zoötechnics, exterior of animals, German.

Fifth year: First semester: Special zoötechnics of solipeds, dogs and cattle, abattoirs and meat industry, sanitary police, German, horseshoeing (elective). Second semester: Special zoötechnics of sheep, goats and swine, dairy industry, food inspection and analysis of food, legal veterinary medicine, pasture and forage, culture, rural economics, German.

Sixth year: (Graduate course leading to the title of Ingeniero Pecuario.) First semester: Analytical chemistry, cytology and advanced genetics, experimental bacteriology, animal psychology, statistics and commerce of farm animals. Second semester: Chemical analysis of feeds, endocrinology, epizoölogy, building construction, history of veterinary medicine, a thesis on original investigational or experimental work.

In addition to this complete course of instruction, definite examinations are provided for professorships, sanitary inspectors, veterinary hygienists, municipal veterinary inspectors, and veterinary officers of the army. Those who pass such examination may obtain the title of "ingeniero pecuario" by defending the thesis mentioned in the sixth-year course. The number of professors for each school is fixed at sixteen, with five additional ones for Madrid, where the graduate work is given.

The promotional work falling under the direction of the veterinary service is about the equivalent of our extension services. It conceives the development of live stock associations and coöperatives and the holding of meetings in the more thickly populated centers for giving the public instruction on the breeding

and care of animals, in other words, on the vulgarization of technical knowledge helpful to the stock-owning people. The scope of such instruction (and this is what shows foresight) *must be submitted for the approbation of the Veterinary Inspector General.*

The veterinary inspector general of animal production has charge of breeding stations, stallion depots, technical bulletins, statistics, registrations (herd-books), pedigrees, fairs and markets, and such complementary industries as apiculture, columboculture, cuniculture and sericulture. The regulations appertaining to these services are definitely described. This service is so broad and diversified that it is divided into five separate bureaus, each operated under the direction of a competent veterinary official.

The operations of this section are vast and obviously as complicated as they are important. In the Bureau of Statistics, the rules for registration alone, set down for horses, cattle, sheep, swine, dogs, goats, fowl, rabbits, bees and silk worms, make up a set of regulations showing that animal husbandry and veterinary science are too interlocking to be separated easily one from the other. Spain has seized the idea of unification and has shaped its veterinary curricula so as to avoid the futile division of authority which in other countries is still creating but half-baked experts in both enterprises. It is pleasant to read regulations which wisely forestall the development of a system of veterinary medicine that nurses intrusions by undertrained public officials. For this foresight our Spanish colleagues must be complimented.

The veterinary inspector general of hygiene and sanitation is charged with the operation of three bureaus: (1) Bureau of Epizoötics, (2) Bureau of Bromatologic Hygiene and (3) Bureau of Professional Practice. The work includes the control of contagious disease, the inspection of milk and meat, municipal, national and industrial abattoirs, canned meat and fish, and importations and exportations of animals and animal products.

All veterinarians who practice privately or who fill public office are obliged to belong to the "agremiación profesional" of their province (local association), formerly known as the *Colegio Oficial Veterinario.* These associations are the official representatives of the country on professional and technical matters. Amalgamated, they constitute the national association. In effect, they are professional juries held responsible for the handling of disease problems and acts of clinicians requiring cor-

rective action. However, in all cases and properly so, all offenders have recourse to an appeal to the head of the veterinary service.

Only graduates are permitted to practice veterinary medicine. It is the exclusive function of the graduate veterinarians to vaccinate animals, administer medicinal and surgical treatment, examine animals for their health at fairs and markets, and render all expert service required for "the hygiene, the health, the production, the exploitation, and the economics of farm animals." All persons not possessing the title of veterinarian who intrude upon any of the aforesaid functions "will be vigorously prosecuted." The provincial association is charged with the duty of guarding against all overt acts and with the reporting of them to the provincial veterinary inspector.

In general it is evident that the National Veterinary Association of the Republic of Spain has succeeded in impressing upon the new government that veterinary science is destined to play an important rôle in the economic life of modern people. The errors committed in the name of veterinary medicine in other countries, to their own disadvantage, have been avoided. In laying down the foundation for its veterinary service, Spain has retained all that is good and eliminated everything that is harmful to its animal industry. The new republic has profited by the unhappy experiences handed down through the decades and has started out by putting animal problems into the hands of "animal engineers," a name, the reviewer believes, that was coined in America by Dr. Leonard Pearson, in 1898, at the annual meeting of the American Veterinary Medical Association in Omaha.

L. A. M.

LEHRBUCH DER HELMINTHOLOGIE. (Textbook of Helminthology. A Natural History of the Worms Parasitic in Mammals and Birds of Germany, with Special Reference to the Helminths of Man, Domesticated Animals and the Most Important Useful Animals. Title transl.) Dr. Curt E. W. Sprehn. 4°, XVI + 998 pages, with 374 illustrations. Borntraeger Bros., Berlin, 1932. Bound, 96 RM.

For many years veterinarians, medical men and zoölogists interested in animal parasitology have hoped for a comprehensive work treating of general biology and affording a means of at least approximate identification of the forms with which they are

concerned. In a remarkable degree such a treatise on the worms is now afforded by Dr. Sprehn's "Lehrbuch der Helminthologie."

In one quarto volume, there is first discussed in 120 pages the general biology of the parasitic worms, a phase of the subject which the author points out must lie at the foundation of all helminthologic research. The general features of the relation of parasitic worms to disease are considered, with special emphasis on diagnosis and control. Part one closes with an excellent though brief discussion of technic.

Part two is chiefly taxanomic. While it considers primarily the helminths of mammals and birds of Germany, the author has taken a broad view of the field and his keys and illustrative material include not only the parasites of domesticated animals but of those potentially useful, as well.

In 90 pages are presented the most extensive host lists which have been made available to workers at large. There are 54 pages of bibliography and a very comprehensive index. The 374 illustrations are in large part original and add greatly to the interpretation of the descriptions.

On the whole, the author has succeeded admirably in his effort to present a text which will not only serve as a guide for practitioners and students of helminthology, but will greatly stimulate research work in this interesting field.

It is to be regretted that in keeping with current practice in Germany, the price, twenty-four dollars, is excessive. The inevitable result of this policy on the part of leading publishers will be a loss of leadership in the production of scientific works.

W. A. R.

Fifth World Poultry Congress at Rome

The Fifth World Poultry Congress, according to an announcement in *Poultry Science*, will be held in Rome, Italy, September 6-15, 1933. The Ministry of Agriculture and Forestry, under the High Patronage of H. M. The King of Italy, has published a provisional announcement in regard to the Congress. Dr. Alessandro Ghigi, General Commissioner of the Congress, was in the United States this summer making arrangements leading to a successful Congress. He requests that the titles of papers to be presented be sent to Dr. Morley A. Jull, Bureau of Animal Industry, U. S. Department of Agriculture, Washington, D. C., prior to January 1, 1933. The papers themselves should be submitted to Dr. Jull not later than March, 1933.

METABOLISM STUDIES ON THE BRUCELLA GROUP. VII. The utilization of dextrose. C. E. ZoBell and K. F. Meyer. Jour. Inf. Dis., li (1932), 1, p. 109.

Determinations of the terminal reactions on 286 strains in dextrose media failed to distinguish between the types of Brucella. In media that contained 1 and 5 per cent peptone, the average dextrose utilization of the abortus types was less than that of the other types, but the difference was not great or constant enough to be differential.

THE EFFECT OF PROLONGED DISTENTION OF THE STOMACH IN DOGS. J. Paul Burgess, Horace G. Scott and A. C. Ivy. Arch. Int. Med., xlix (1932), 3, p. 439.

Continuous distention of the stomach with a volume of water introduced into a balloon (a volume twice that which would be ingested in the form of milk in hunger) caused grave morbid disturbances to occur in the walls of the stomach and resulted in death in 12 dogs within a period of from 26 to 90 hours without a significant fall in blood chlorids and dehydration. The cause of death was toxemia. The absorption of toxic products from cellular trauma or destruction due to disturbed circulation produces the toxemia.

AN ACUTE INFECTIOUS OMPHALITIS (INFLAMMATION OF THE NAVEL) OF BABY CHICKS. C. A. Brandley. Poultry Sci., xi (1932), 5, p. 279.

The outbreaks observed undergo a rapid course, death resulting in 2 to 8 hours following the onset of symptoms of the disease. A large moist improperly closed umbilicus or an improperly healed umbilicus showing scab formation was often observed. Necrosis and softening of the umbilicus and the proximal external tissues, with an increase in size and tension of the abdomen, developed rapidly in typical cases. The skin and skeletal muscle were last observed to be dissolved within 8 to 12

hours following death. "Mushy chick disease" is the term often applied to this condition. A marked putrefactive odor was present in all cases in which there was necrosis and lysis. The anaerobic flora appeared to be constant, *Clostridium sporogenes* and *Clostridium tertius*, both ordinarily non-pathogens. Typical cases of the disease were produced by tissue suspensions from natural cases. Typical cases were not produced with pure cultures of the organisms isolated, although all chicks died that were injected with *Clostridium sporogenes*.

STUDIES ON COCCIDIOSIS. III. Observations on paralysis with special reference to coccidial infection. Roy L. Mayhew. Poultry Sci., xi (1932), 5, p. 289.

A type of paralysis in chickens is described in which there is usually loss in weight and atrophy of the muscles of the infected parts. Recovery is rare. The evidence indicates that only 41 per cent of the infected birds were not infected with coccidia during their lifetime. None of the birds developing paralysis were infested with round worms, tapeworms or other intestinal parasites. Cases were observed in chicks as young as eight weeks and as old as eight months. Thirteen of the 27 cases developed between three and fifteen weeks of age. Of the 27 cases studied, 14 were males and thirteen were females. Eight of the males were among the inoculated birds and 6 among the controls. Of the females, 8 were among the inoculated birds and 5 among the controls.

APOPLECTIFORM SEPTICEMIA IN TURKEYS. Fritz Volkmar. Poultry Sci., xi (1932), 5, p. 297.

Symptoms of the disease have been found to be akin to cholera; the onset is sudden, birds segregate themselves and appear drowsy and sleepy. The turkeys appear sick from 12 to 18 hours before death. The appetite is suppressed and diarrhea is sometimes present. Mortality in observed outbreaks has been 15 per cent and the duration of the epizoötic 7 to 10 days. Lesions in turkeys seem to be identical with those found in chickens. Diffuse hemorrhage was observed in the skin and muscular tissue; venous congestion prevailed throughout; heart sac and abdominal cavity contained some serosanguineous exudate; the liver was studded with dark red hemorrhages and sometimes areas of miliary necrosis were scattered over the surface; the duodenum was congested and inflamed with ecchymoses frequently present. *Streptococcus capsulatus-gallinarum* was iso-

lated from the infected turkeys. Saline suspensions injected intravenously in rabbits caused death within 6 to 18 hours and in chickens death ensued after 10 days. In chickens injected intraperitoneally death occurred after 2 weeks.

PRIMITIVE OR FILTRABLE FORMS OF BACTERIA AND THEIR OCCURRENCE IN ASEPTIC MILK. Herman J. Brueckner and James M. Sherman. Jour. Inf. Dis., li (1932), 1, p. 1.

The authors have demonstrated that primitive forms of bacteria were present in the aseptically drawn milk of the healthy cows studied. The primitive forms of bacteria may sometimes occur in numbers approximating a trillion per gram of substance. The morphologic types observed were cocci and small rods. The conclusion is reached that while the life-cycle theory of previous investigators is a plausible and attractive explanation of the results obtained, the author's work does answer the question of whether these organisms are definite species or represent only a dissociative form in the development of ordinary bacteria.

INHERITANCE OF RESISTANCE AND SUSCEPTIBILITY TO INFECTIOUS ABORTION. Miguel Manresa. Jour. Inf. Dis., li (1932), 1, p. 30.

The offspring of the different lines of susceptible animals tended to be very largely susceptible, and consistently produced susceptible progeny. A high percentage of resistant animals was observed in the different lines of animals in the resistant group. These characteristics are transmitted by inheritance to successive generations, probably through a single pair of mendelian factors. The characteristic for resistance is dominant over that for susceptibility. Whether this dominance is complete or partial is a matter for future study. An appreciable amount of immunity is developed in susceptible does following artificial inoculations with a virulent strain of *B. abortus*. The immunity so conferred is transitory.

COLON ACTIVATION BY INTRAVENOUS HYPERTONIC SODIUM CHLORID INJECTION IN UNANESTHETIZED, TRAINED DOGS. Frederick F. Yonkman. Proc. Soc. Exp. Biol. & Med., xxix (1932), 9, p. 1207.

Varying amounts, 2 to 15 cc of sodium chlorid, 5 and 20 per cent concentrations, were injected intravenously and intracardially. The injection of 5 per cent sodium chlorid results as follows: slightly augments colonic tonus, increases peristaltic

amplitude, does not alter peristaltic frequency and shows little or no disturbance of frequency and amplitude of rhythmic waves. The injection of 20 per cent sodium chlorid resulted as follows: augments colonic tonus, increases peristaltic amplitude, induces peristalsis in the quiescent, atropinized colon, shows little or no augmentation of frequency and amplitude of rhythmic waves, and does not produce vomiting or retching movements.

PATHOLOGICAL CHANGES IN THE LIVER ACCOMPANYING INTESTINAL OBSTRUCTION AND STRANGULATION. Warren H. Cole and Robert Elman. Proc. Soc. Exp. Biol. & Med., xxix (1932), 9, p. 1274.

The most significant histological effect produced in the livers of dogs with simple intestinal obstruction consisted of central necrosis of the cells of the liver lobules with loss of nuclei and fragmentation of the cells. The sinusoidal spaces appeared widened with a thinning of the hepatic cells which had retained their vitality. Occasionally these spaces were filled with blood. Cloudy swelling was present. The animals dying from obstruction accompanied by strangulation showed the same changes except that the percentage of animals revealing the most marked damage was greater. Hepatic function tests, using 40 mg. of phenoltetraiodophthalein per kilo body weight, were performed on 16 animals; the retention in animals with strangulation was slightly higher. Bacteria were found in the livers of only three dogs. Samples of thoracic-duct lymph, portal blood and systemic blood showed only slight toxicity when injected into guinea pigs and mice intraperitoneally.

FURTHER OBSERVATIONS ON THE RAPIDITY OF PASSAGE OF SUBSTANCES FROM BLOOD TO LYMPH IN THE DOG. Florence W. Haynes. Amer. Jour. Physiol., ci (1932), 2, p. 223.

Dyes such as brom-phenol blue and vital red, when injected into the jugular or femoral vein, appeared in the lymph from the neck in approximately 2½ minutes and in the lymph from the legs in 6 to 8 minutes. The skin and mucous membranes appeared blue in less than 30 seconds. Egg albumen could be detected in the cervical lymph in 9 to 14 minutes after the beginning of injection and in the lymph of the hind leg in 13 minutes. Hemoglobin appeared in the subcutaneous lymph from 30 to 45 minutes after injection. The experiments suggest a rapid interchange of material between blood and subcutaneous lymph.

ARMY VETERINARY SERVICE

Regular Army

No changes during the month of October.

Veterinary Reserve Corps

New Acceptances

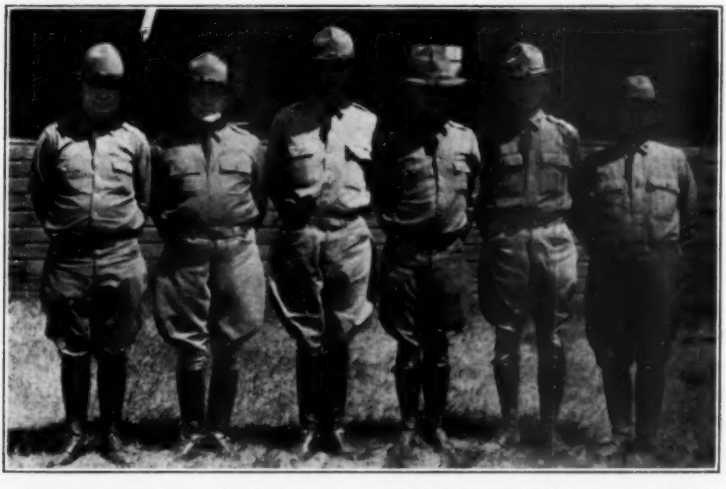
McConnell, Roy Lewis...Capt....2704 Walnut St., Coffeyville, Kan.
Bixby, John Snell.....2nd Lt..1027 Pierce Ave., Port Townsend, Wash.
Maier, Elmer Alvin.....2nd Lt..1476 W. San Antonio St., New Brunfels, Tex.

Promotions

To

Paquin, Leon Anthony..Major ..5 Negus St., Webster, Mass.
Walden, Robert Sanders.Capt....Lennon, S. Dak.
Bolin, Fonsoe Marion...1st Lt...2042 Monroe St., Corvallis, Ore.

At Fort Snelling



Veterinarians in attendance at the Medical Training Camp, Fort Snelling, Minn., the past summer. Left to right: Capt. A. L. Born, Story City, Iowa; Capt. Robt. D. Wall, Des Moines, Iowa; Maj. H. E. Van Tuyl, Manhattan, Kan.; Capt. L. O. Fish, Spencer, Ind.; Capt. F. Low, Oaks, N. Dak.; Capt. E. M. Brady, Red Oak, Iowa. All are Veterinary Reserve officers, except Major Van Tuyl, of the Veterinary Corps of the U. S. Army.

TUBERCULOSIS AND THE DEPRESSION

By A. SCHAEFFER, JR.

A curious paradox of the present depression is that, apparently contrary to all previous experience and belief, the death-rate from tuberculosis has not risen. It has been preached for years that "poverty and tuberculosis go hand in hand," yet even after three years of lowered living standards the tuberculosis death-rate continues to fall steadily.

Does this destroy all previous knowledge? Have tuberculosis associations throughout the United States been broadcasting incorrect information? Has the money that has gone into health education year after year been wasted?

The answer is emphatically "No." The need for spreading the doctrine of "Watch Your Health" is greater now than it ever was, for in addition to the threat contained in lowered living conditions is the danger of worry, which often is ignored, but which is of great importance medically. It should be remembered that tuberculosis is not an overnight disease that comes on one suddenly. It usually steals into the body, taking its own time to establish a strong foothold before giving notice of its presence. Therefore, although it may seem surprising that the tuberculosis death-rate continues to go down during the present depression, it is impossible to guess how many people are now contracting the disease which in many cases will not make its presence known for years to come.

Again, many persons are on the ragged edge of health, and a slight push, such as lack of food, or even worry, is likely to tip the balance against them. There are also the persons who, without knowing it, have the disease, and in their case the end of the battle may be hastened by excessive deprivation.

Most important of all is the possible effect of the depression

on children. Our present knowledge of how tuberculosis begins and develops during childhood is that the child's living conditions and environment help to determine whether or not the child with early lesions will later develop the adult type of the disease. Many children now heavily infected are at present presumably suffering enough deprivation to cause the balance to turn unfavorably, and as a result they will later become victims of the disease. Thus, the havoc wrought by the present depression is not likely to show as a sudden hump in the mortality curve, but will be spread over a period of years, and this will make the situation seem less important than it actually is.

In considering these facts it should be kept fixed in mind that poverty by itself does not and cannot cause tuberculosis. Tuberculosis is caused only by the tubercle bacillus. The person who has the disease is the chief source of infection to others. The germs of tuberculosis are likely to be in his sputum, on his lips, and on the eating and drinking utensils he uses, unless they are carefully washed. The more intimate the contact with such a person is, the greater is the danger of acquiring the disease. Children in a tuberculous household are very likely to become infected.

It is for this reason that when a doctor discovers tuberculosis in one of his patients he urges that every member of the family shall be examined to discover which member is giving it to the others.

The importance of keeping these facts vividly before the public is greater at the present time than at any single period of the past. And in addition to this educational work, which is conducted in practically every town of the United States by the 2,084 affiliated state and local tuberculosis associations, clinics must be maintained, preventoria conducted, nursing service continued and various other phases of anti-tuberculosis work supported.

It is at this time of the year that the tuberculosis associations make their annual plea for support, and in securing that support demonstrate the power of the penny. For the funds that maintain their work are obtained by the sale of brightly colored little stamps called Christmas seals, which cost only a penny each. They are easily identified by reason of the fact that each one bears the bright red double-barred cross that is the insignia of anti-tuberculosis work throughout the world.

NECROLOGY

CLAUDE LESLIE SEGER

Dr. C. L. Seger, of Jackson, Minn., terminated his life by suicide, July 3, 1932, near Brainerd, Minn. In the fall of 1929, Dr. Seger was in an automobile accident, from the effects of which he never recovered. In the spring of 1931 he became a patient at the Saint Peter (Minn.) Hospital for the Insane.

Born at Eau Claire, Wis., September 6, 1882, Dr. Seger attended local schools and then entered the McKillip Veterinary College. Following his graduation in 1909, he located for general practice at Janesville, Minn. He served as mayor of the town in 1916. Shortly thereafter he removed to Jackson, where he continued to practice. Later he became interested in the milling business, erecting a fine flour mill in Jackson, which proved to be highly successful as a business enterprise.

Dr. Seger joined the A. V. M. A. in 1920. He was a member of the Minnesota State Veterinary Medical Society. He is survived by his widow (née Hazel M. Marshman) and four children.

H. C. H. K.

LOUIS D. RYAN

Dr. Louis D. Ryan, of Emporia, Kan., was killed the evening of October 14, 1932, when his automobile struck a bridge culvert. He was a graduate of the Ontario Veterinary College, class of 1896.

LAFAYETTE HUEY LEWMAN

Dr. L. H. Lewman, of Big Springs, Neb., died at his home, October 18, 1932, after an illness of several months.

Born near Thurston, Ore., April 25, 1890, Dr. Lewman moved with his family to Haxtun, Colo., in 1904. He attended grade and high schools before taking up the study of veterinary medicine at Colorado Agricultural College. Upon being graduated in 1921, he entered practice at Big Springs, Neb. He earned quite a reputation as a cowboy while in his teens and his prowess in that field enabled him to win many championship contests.

Dr. Lewman joined the A. V. M. A. in 1924. He is survived by his widow (née Anna Buback), one daughter, his father and one brother.

DANIEL H. ROWE

Dr. Daniel H. Rowe, of Little Falls, N. Y., died on October 20, 1932, after an illness of several months caused by a complication of diseases. He was a graduate of the Ontario Veterinary College, class of 1890, and had practiced his profession at Little Falls upwards of forty years. He is survived by two sons, one of whom, Dr. Roy Rowe (Corn. '11), is a veterinarian.

Dr. Rowe had been a subscriber to the JOURNAL since 1903.

ANGUS WARNER TRACY

Dr. Angus W. Tracy, of Sherbrooke, Quebec, died October 26, 1932, after a brief illness.

Born at Granby, Quebec, September 7, 1870, Dr. Tracy was educated at the Granby High School and McGill University. He was graduated from the latter in 1893. From 1897 until 1902, Dr. Tracy served in the Royal Canadian Mounted Police, except for about 20 months spent in South Africa with the Mounted Rifles during the Boer War. He always took a deep interest in military matters and for twenty years or more he was actively associated with the Canadian Army Veterinary Corps. During the World War Dr. Tracy again rendered valuable service to his country.

In 1902, Dr. Tracy located in Sherbrooke and became one of the city's outstanding citizens. He was the first and only municipal meat inspector of Sherbrooke. The City Council took official notice of his death at a special meeting the day following his demise.

Dr. Tracy joined the A. V. M. A. in 1912. He was an active member of the Sherbrooke Snowshoe Club and Prince of Wales Lodge, No. 63, A. F. & A. M.

Besides his widow (née Lucille G. Walley), two sons and one brother survive.

FRED GOODALL

Dr. Fred Goodall, of Gilmore City, Iowa, died at the Cherokee Hospital, Fort Dodge, Iowa, October 30, 1932, after an illness of five months. Cerebral hemorrhage was the immediate cause of death.

Born at Fairfield, Ill., August 21, 1886, Dr. Goodall attended local grade and high schools. He enlisted in the Army during

the World War and entered the Saint Joseph Veterinary College after the close of the war. He completed his veterinary course at the Indiana Veterinary College. Following his graduation in 1923, Dr. Goodall located at Gilmore City, Iowa, for general practice.

Dr. Goodall joined the A. V. M. A. in 1924. He was a member of the Iowa Veterinary Medical Association. He is survived by his widow and four brothers. Burial was at Fairfield, Ill.

HENRY J. HELLWIG

Dr. Henry J. Hellwig, of Toledo, Ohio, died at his home, November, 8, 1932, after an illness of sx years. He was 64 years of age.

Dr. Hellwig was a graduate of the Ontario Veterinary College, class of 1892. Until eight years ago he operated a hospital in Toledo. He then moved out on the Woodville road, where he established an animal cemetery. He is survived by his widow, three daughters and four brothers. Burial was at Elliston, Ohio, his former home.

FRED O. N. HOVEY

Dr. Fred O. N. Hovey, of Detroit, Mich., died November 9, 1932, while visiting relatives at Marshalltown, Mich. He was 56 years of age.

The deceased was a graduate of the Grand Rapids Veterinary College, class of 1900, but had not been engaged in veterinary work for a long time. He had training in pharmacy and for a number of years was employed in the pharmaceutical manufacturing department of Parke, Davis & Company, at Detroit. Later he held a similar position with Frederick Stearns & Company, in the same city. He is survived by his widow, one daughter and one sister.

W. DEAN WRIGHT

Dr. W. Dean Wright was killed instantly, in an automobile accident, the night of October 17, 1932, while on his way from Ogden, Utah, to Tacoma, Wash., to take charge of meat inspection at the Carstens Packing Company plant, at Tacoma, for the U. S. Bureau of Animal Industry. According to the report of the coroner, the accident was caused by fast driving on a wet highway. Dr. Wright's car skidded and struck a telephone pole. He received numerous serious injuries, including a broken

neck, that resulted in instant death. His wife and daughter, who were with him at the time, escaped serious injuries, although both were thrown from the car.

Dr. Wright had been in the service of the U. S. Bureau of Animal Industry for about twenty-three years, having been stationed at Portland, Oregon, from 1909 until about 1914, and then at Boise, Idaho, until about 1924, when he was transferred to Ogden, Utah. He was a graduate of the Chicago Veterinary College, class of 1903, and joined the A. V. M. A. in 1904, while connected with the Bureau of Insular Affairs, at Manila, Philippine Islands. He returned to the United States in 1906 and was located in Oregon for several years, with the Southern Pacific Railroad. He was the first secretary of the Intermountain Live Stock Sanitary Association, organized at Ogden, Utah, January 6, 1927.

JOHN HENRY FORSYTH

Dr. John H. Forsyth, of Blissfield, Mich., died at his home, November 23, 1932, after an illness of several weeks, caused by an attack of paralysis. He was a native of Blissfield and spent most of his 63 years in that community. Following his graduation from the Chicago Veterinary College in 1911, he practiced for a short time at Palmyra, Mich., later returning to Blissfield.

Dr. Forsyth was a member of the Michigan State Veterinary Medical Association and the Masonic lodge at Palmyra. He is survived by his widow, two daughters, two sons and one brother.

E. C. W. S.

Our sympathy goes out to Dr. R. H. Mohlenhoff, of Cleveland, Miss., in the death of his wife, November 3, 1932, and to Dr. J. A. MacPhail, of Manistique, Mich., in the death of his wife, November 17, 1932, following an operation for kidney trouble.

PERSONALS

MARRIAGE

Dr. Clarence W. Sprowls (O. S. U. '25), of Wooster, Ohio, to Mrs. Nora Fry, of Ashland, Ohio, November 13, 1932, at Ashland, Ohio.

PERSONALS

Dr. B. C. McClintock (Chi. '94) has removed from Vicksburg, Mich., to Schoolcraft, Mich.

Dr. Fred Conover (Chi. '04), of Petersburg, Ill., was reported to be seriously ill recently.

DR. LAWRENCE O. MOTT (K. S. C. '29) has removed from Astoria, Ore., to Spencer, Nebr.

DR. R. G. CHAPMAN (Ont. '26) has been transferred from Calgary, Alta., to Moose Jaw, Sask.

DR. LEO W. FUGATE (O. S. U. '32) has opened an office in Paintersville, Ohio, for general practice.

DR. A. C. ELDRED (Corn. '32) is a member of the staff of the North Shore Animal Hospital, Evanston, Ill.

DR. EMLEN WOOD (U. P. '16) is Acting Librarian at the Library of the College of Physicians of Philadelphia.

DR. R. E. SIMONSEN (Iowa '22) has requested a change of address from Marcus, Iowa, to Boston, Mass.

DR. A. L. BROWN (Corn. '15), of Deposit, N. Y., was elected to the New York State Legislature at the recent election.

DR. F. J. EMMER (Ont. '08-'16), who located in Shepherd, Mich., last spring, has returned to his former location in Richmond, Mich.

DR. E. C. GOODRICH (Gr. Rap. '15), who was located in Kalamazoo, Mich., for a number of years, has removed to Vicksburg, Mich.

DR. D. A. CURTIS (Gr. Rap. '12) was elected Gratiot County (Mich.) Veterinarian, at the October meeting of the County Board of Supervisors.

MAJ. R. A. KELSER (Geo. Wash. '14), of Washington, D. C., has been a patient at Walter Reed Hospital the past month on account of a stomach ailment.

DR. J. T. BROWN (K. C. V. C. '15), of Belleville, Ill., recently reported the tuberculin testing of 1,302 cattle in Saint Clair County, without disclosing a single reactor.

DR. A. M. CASPER (Chi. '93), who was retired from active service in the U. S. Bureau of Animal Industry recently, is now living at 2131 N. 70th St., Wauwatosa, Wis.

DR. W. A. JAMES (O. S. U. '29), formerly with the Iodine Educational Bureau, New York City, has opened an office and hospital at 1122 W. Market St., Warren, Ohio.

DR. W. A. BROWNE (K. S. C. '28), formerly of Cottonwood Falls, Kan., has removed to Emporia, Kan., for general practice. His office is located at 25 E. Fourth Ave.

DR. F. G. CASLICK (Corn. '30), who has been at the Glen Farm, Newport, R. I., for some time, has removed to Morristown, N. J., where he is now engaged in general practice.

DR. GEORGE R. AGIN (Cin. '09) recently opened a pet shop at 3317 Harrison Ave., Westwood, Ohio. He also conducts a hospital and boarding kennel near Miamitown, Ohio.

DR. P. V. HOWARD (Mich. '22), for six years a member of the meat inspection staff of the Detroit Board of Health, has been appointed Chief Meat Inspector of Sandusky, Ohio.

DR. J. G. HARMELING (Gr. Rap. '17), who has been employed by the Wisconsin Department of Agriculture in connection with tuberculosis eradication, has located at Baldwin, Wis.

DR. J. F. KENNELLY (Ind. '23), who has been with the Wisconsin Department of Agriculture for several years, has resigned his position and will engage in general practice at Hartford, Wis.

DR. LAUREN L. BECHTOL (O. S. U. '32) has accepted a position as veterinarian for the E. V. Niel Farms, of Troy, Ohio. Dr. Bechtol will have the health of a large herd of Guernseys under his supervision.

DR. H. C. RINEHART (McK. '11), of Rushville, Ill., had his Ford coupe stolen recently. At the time of the theft, the car contained quite a number of instruments. Neither the car nor the instruments were insured.

DR. M. L. DAVENPORT (Corn. '03), who was located at Fergus Falls, Minn., until his recent retirement from the service of the U. S. Bureau of Animal Industry, is now located at 1843 Berkeley Ave., Saint Paul, Minn.

DR. DAVID J. LYNCH (Ont. '12) recently located in Saint Louis, Mich., where he is engaged in general practice. Dr. Lynch practiced at Shepherd, Mich., prior to entering the service of the U. S. Bureau of Animal Industry last spring.

DR. J. H. MURPHY (T. H. '15), of Paris, Ill., was the principal speaker at the November meeting of the Paris unit of the Edgar County Farm Bureau. He spoke on the activities of the U. S. Bureau of Animal Industry in the work of eradicating foot-and-mouth disease from California, early in the year.

DR. P. D. ATKINS (O. S. U. '04), of Hallsville, Ohio, received minor injuries, the latter part of October, when his automobile skidded on the road east of Chillicothe and hit a telephone pole. His son, who was driving the car, was so seriously injured that he died shortly after being taken to a hospital.

DR. GEO. M. SIMMONS (Iowa '25), formerly Chief Veterinarian for the San Francisco Society for the Prevention of Cruelty to Animals, announced his association with Dr. Oscar J. Kron (N. Y.-Amer. '07), in his new Dog and Cat Hospital, at 1386 Golden Gate Ave., San Francisco, Calif., on November 1.

DR. R. E. BERGMAN (Mich. '21), of Cassopolis, Mich., was seriously scalded about the head and face, when he removed the cap from the radiator of his automobile, November 11. He was ready to start on a hunting trip when the accident occurred. It was the result of the lower part of the radiator being frozen.

DR. B. M. TROXEL (K. C. V. C. '12), of Waterloo, Ill., had reason to regret his kindness in giving a ride to a hitch-hiker, early in November. The latter robbed Dr. Troxel of $45.00 and his automobile, besides inflicting several serious bullet wounds which made it necessary for Dr. Troxel to be taken to a hospital.

DR. JAMES M. MILLER (McK. '13), of Benton Harbor, Mich., appears to have been defeated for the office of sheriff of Berrien County, at the recent election, by the narrow margin of 82 votes. Dr. Miller received 16,049 votes, and his Republican opponent, Charles Miller, 16,131 votes. Dr. Miller has asked for a recount.

DR. NEIL B. JONES (Ont. '90), of Washington C. H., Ohio, won an election bet from one of his friends who paid by riding a white horse and jingling a cow-bell through the business section of the city, Saturday afternoon, November 12. Dr. Jones had bet on Governor Roosevelt. The loser, according to report, had planned to ride a white mule, but the latter decided that he would not be ridden.